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ABSTRACT

This guide is intended to inform the people of North Carolina of the advantages of apprenticeship training and to promote the registration of apprentices and apprenticeship programs. It opens with a general description of the system of apprenticeship, including an account of the role of the North Carolina Department of Labor. Next, profiles are set forth of the 20 skilled crafts, out of the nearly 700 recognized apprenticeable occupations, that enroll the greatest number of apprentices in the state. Each profile opens with a summary of the job description set forth in the Dictionary of Occupational Titles, which then continues with a more detailed description of duties performed by the worker. Most of the job descriptions cover certain similar subjects, such as entrance requirements, training period, working conditions, tools and equipment, opportunities for women, job outlook, and upward mobility. Addresses are presented for organizations that can provide more information. The appendixes contain useful information concerning: (1) the 1986 average journeyworker wages for newly completed apprentices; (2) a glossary of terms; (3) a list of apprenticeship representatives and their addresses and telephone numbers, and (4) some traditional questions and answers about apprenticeship. (YLB)

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Apprenticeship Reference Guide

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Apprenticeship and Training Division
North Carolina Department of Labor
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Commissioner of Labor

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TABLE OF CONTENTS

The National Apprenticeship Act [THE FITZGERALD ACT] ..... *vii*

Preface ..... *ix*

Introduction ..... *xi*

PART ONE: WHAT IS APPRENTICESHIP? 1

- Definition 1
- Role of the North Carolina Department of Labor 1
- Program Operation 2
- Kinds of Sponsors 2
- Kinds of Trades (Apprenticeable Trades Registered with the North Carolina Department of Labor as of April 1986) 3
  - Building and Construction Trades 3
  - Industrial Trades 3
  - Service Trades 3
  - Public Employment Trades 3
- Length of Programs 4
- Related Instruction 4
- Hands-On-Training 5
- Wages 6
- Veterans 6
- Age 6
- Educational Levels 6
- Costs 7
- Record-Keeping Requirements 7
- Apprenticeship Agreements 7
- Certificate of Completion 8
- Equal Employment Opportunity 8
- Women in Apprenticeship 8

TABLE OF CONTENTS

PART TWO: THE TWENTY SKILLED TRADES ENROLLING THE GREATEST NUMBER OF APPRENTICES IN NORTH CAROLINA 11

- Automobile Mechanic 13
- Bricklayer 15
- Carpenter 17
- Electrician 19
- Environmental Control Systems Installer/Servicer [Heating, Ventilation, and Air-Conditioning Mechanic (HVAC)] 21
- Firefighter 23
- Instrument Repairer/Mechanic 25
- Insulation Installer 27
- Knitting Machine Fixer 29
- Law Enforcement Officer 31
- Machinist 33
- Maintenance Repairer/Mechanic 35
- Millwright 37
- Pipefitter 39
- Plumber 41
- Psychiatric Aide 43
- Rotogravure-Press Operator 45
- Sheet Metal Worker 47
- Structural Steel Worker 49
- Tool and Die Maker 51

PART THREE: APPENDICES 55

A - Journeyman Wages for Newly Completed Apprentices for 1986 57

B - Glossary of Terms 61

C - List of Apprenticeship Representatives 63

D - Frequently Asked Questions and Answers about Apprenticeship 65

[The Fitzgerald Act]

THE NATIONAL APPRENTICESHIP ACT
(50 Stat. 664; 29 U.S.C. 50)

To enable the [U.S.] Department of Labor to formulate and promote the furtherance of labor standards necessary to safeguard the welfare of apprentices and to cooperate with the States in the promotion of such standards.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of Labor is hereby authorized and directed to formulate and promote the futherance of labor standards necessary to safeguard the welfare of apprentices, to extend the application of such standards by encouraging the inclusion thereof in contracts of apprenticeship, to bring together employers and labor for the formulation of programs of apprenticeship, to cooperate with State agencies engaged in the formulation and promotion of standards of apprenticeship, and to cooperate with the National Youth Administration and with the Office of Education of the Department of the Interior in accordance with section 6 of the Act of February 23, 1917 (29 Stat. 932), as amended by Executive Order Numbered 6166, June 10, 1933, issued pursuant to an Act of June 30, 1932 (47 Stat. 414) as amended.

SEC. 2. The Secretary of Labor may publish information relating to existing and proposed labor standards of apprenticeship, and may appoint national advisory committees to serve without compensation. Such committees shall include representatives of employers, representatives of labor, educators, and officers of other executive departments, with the consent of the head of any such department.

SEC. 3. On and after the effective date of this Act the National Youth Administration shall be relieved of direct responsibility for the promotion of labor standards of apprenticeship as heretofore conducted through the division of apprentice training and shall transfer all records and papers relating to such activities to the custody of the Department of Labor. The Secretary of Labor is authorized to appoint such employees as he may from time to time find necessary for the administration of this Act, with regard to existing laws applicable to the appointment and compensation of employees of the United States: *Provided, however,* That he may appoint persons now employed in division of apprentice training of the National Youth Administration upon certification by the Civil Service Commission of their qualifications after nonassembled examinations.

SEC. 4 This Act shall take effect on July 1, 1937, or as soon thereafter as it shall be approved.

Approved, August 16, 1937.

PREFACE

The North Carolina Department of Labor is the accrediting agency for on-the-job training in North Carolina. It is publishing this guide to inform the people of North Carolina of the advantages of apprenticeship training and to promote the registration of apprentices and apprenticeship programs.

Apprenticeship has many important advantages to offer both to the State's young people, just starting out in the world of work, and to older workers who either find that their family responsibilities prevent them from pursuing technical education in educational institutions or who otherwise face unemployment from plant automation or closings. Formal apprenticeship is a thorough, practical, efficient, and cost-effective mechanism for training highly skilled workers essential to industry and business in North Carolina. The apprentices *earn as they learn* because they are already employed. Apprenticeship training increases workers' pay, job security, advancement opportunities, prestige, and self-respect.

Many employers in North Carolina have found apprenticeship training to be an excellent way to obtain high-quality, skilled craftworkers who might not otherwise be available. Also, employers who show confidence in their employees by providing career advancement opportunities, like apprenticeship training, report higher morale, motivation, and job satisfaction within their work force, resulting in fewer personnel problems.

North Carolina has one of the largest unskilled work forces in the United States today. The State is vigorously pursuing economic development. Many employers already are finding it difficult to obtain the highly skilled craftworkers whom they need while unemployment among skilled workers is unconscionably high in many counties and looks still bleaker in the years ahead. A basic component of the State's economic development strategy must be a deliberate program to significantly expand the training of the highly skilled in the work force.

The North Carolina Department of Labor hopes that this guide will help foster a better understanding of the mental and manipulative processes involved in the skilled trades. Many people not involved with the skilled trades do not have a clear understanding of the degree of proficiency required for successful job performance and career advancement. Many people underestimate the challenges, difficulties, and financial rewards of work in the skilled trades and fail to consider such trades in planning and choosing careers. It is especially important that high school guidance counselors, parents, and students have an appreciation for the complexity and compensation of these occupations so that those students interested in pursuing a particular skilled trade can be provided with adequate preparation in high school.

This guide, modeled in part on the *Ohio Apprenticeship Notebook*, opens with a general description of the system of apprenticeship, including an account of the role of the North Carolina Department of Labor. Next there are set forth profiles of the 20 skilled crafts, out of nearly 700 recognized apprenticeable occupations, that enroll the greatest number of apprentices in the State. The appendices contain useful information concerning (a) the 1986 average journeyman wages for newly completed apprentices, (b) a glossary of terms, (c) a list of apprenticeship representatives and their addresses and telephone numbers, and (d) some traditional questions and answers about apprenticeship.

Each profile opens with a summary of the job description set forth in the U.S. Department of Labor's *Dictionary of Occupational Titles (DOT)*, which then continues with a more detailed description of duties performed by the worker. Most of the job descriptions cover certain similar subjects such as entrance requirements, working conditions, tools and equipment, opportunities for women, job outlook, and upward mobility.

Sources for the information in each profile include interviews with employers; apprentices; teachers at technical schools, community colleges, and universities; representatives of organized labor; and other experts in the field. Textbooks, films, and other literature were also used in the preparation of these profiles. Where possible, those people who were interviewed have been subsequently given an opportunity to read and evaluate the occupational profiles. The department has attempted to make this guide informative, accurate, and interesting, and reviewers have been generous in cooperating with these aims.

So extensive has been the help of outside reviewers that this guide emerges as a collaboration between the North Carolina Department of Labor, apprentices, sponsors of apprenticeship programs, teachers of related training, and other experts. Notwithstanding the assistance of reviewers, however, the department is aware that it is not realistic to expect perfect accuracy in the coverage of fast-changing fields where even people involved on a daily basis may disagree on definitions. The department welcomes and encourages comments about the information contained in this book.

John C. Brooks
North Carolina Commissioner of Labor

INTRODUCTION

High school guidance counselors, teachers, students, parents, young people beginning their careers, employed unskilled workers, and older workers contemplating a change in careers will find this guide an aid to learning about and understanding employment opportunities in the skilled trades. Employers will find it helpful in learning how to start apprenticeship training programs of their own. Members of the general public will find this guide an excellent source of information about the skilled trades in America's increasingly complex and competitive economy. Public policymakers are invited to use the guide as a prospectus for an expanded apprenticeship program, a system which has long been proven effective at training inexperienced people to become skilled craftworkers.

The *Dictionary of Occupational Titles* lists some 24,000 different occupations in our American society. The Federal Committee on Apprenticeship has identified some 750 of these as high-skilled, apprenticeable occupations requiring both technical knowledge and manual proficiency at a high level. Of these, 18 are in the building trades where most craftworkers traditionally have been and continue to be trained principally through apprenticeship training.

Apprenticeship training is a formal system of employee training that combines on-the-job training with related technical instruction. It is designed to produce craftworkers who are fully competent in all aspects of an occupation including knowledge, skill, and proficiency on-the-job. Apprenticeship programs are voluntarily sponsored by employers at their own expense and are equally relevant in non-union and union environments.

North Carolina has many first-rate apprenticeship programs, but needs far more. The current number of apprentices in the State stands at about 2,000. Overall, North Carolina employers need about 20,000 more skilled craftworkers today for jobs which stand empty.[1] Even when unemployment in North Carolina runs over eight percent,[2] employers in some parts of the State advertise in vain for qualified machinists,[3] a shortage that typifies a national need. *Time* magazine reports that jobs by the hundreds of thousands have gone unfilled in the skilled sector of the economy.[4] Joseph A. Limprecht and Robert H. Hays, writing in the *Harvard Business Review* about the American skilled worker crisis, state that 1,000,000 skilled jobs are vacant because of a shortage of trained workers.[5] In order to meet the State's present needs, 20,000 people should be enrolled currently as apprentices.[6] Since most programs are for four years, this might conceivably produce approximately 5,000 new journeymen craftworkers in the State's labor force each year—about the rate now needed. However, considering that current apprenticeship programs have a drop-out rate of nearly 50 percent, the State's need is really for an on-going apprenticeship program of almost 40,000 apprentices.

Recessionary cutbacks are one cause of the inadequate number of apprenticeship programs. Employers tend to cut back on current costs for research and development, capital spending, and training programs in economic downturns because these programs promise benefits mainly for the future rather than for the present.[7]

In North Carolina, the most recent recession left apprenticeship programs in manufacturing in stable condition, but caused those in the construction industry to suffer severe losses. Nationally, the number of apprenticeship programs fell from 324,000

[1]Bob Dennis, "N. C. Ill-Prepared to Meet Demand for Skilled Workers," *The Charlotte Observer*, 18 October 1982, hereinafter cited as Dennis, Ill-Prepared to Meet Demand for Skilled Workers.

[2]As reported in April 1983 by the Employment Security Commission of North Carolina, Labor Market Information Division (Jim Poole, 16 June 1983).

[3]*See, e.g.*, Employment Security Commission of North Carolina Affiliated with the Employment and Training Administration, in Cooperation with the Bureau of Labor Statistics, U. S. Department of Labor *Labor Area Summary, Wilmington SMSA* (Standard Metropolitan Statistical Area, January 1983), showing that more than 70 percent of job openings in the machine trades are in the "Hard-to-fill" category.

[4]"A Shortage of Vital Skills," *Time*, 6 July 1981, 46.

[5]Joseph A. Limprecht and Robert H. Hays, "Germany's World-Class Manufacturers," *Harvard Business Review* (November-December 1982), 144, hereinafter cited as Germany's Manufacturers.

[6]Dennis, Ill-Prepared to Meet Demand for Skilled Workers.

[7]Germany's Manufacturers, 144.

in 1979 to 283,000 in 1982, according to the Bureau of Apprenticeship and Training in the U.S. Department of Labor.[8]

Louis Harris and Associates, Inc., reports that while employment of skilled journeymen in the precision metalworking industry declined by four percent in the first half of 1982, employment of apprentices and trainees fell by 18 percent.[9] These cutbacks guarantee worse shortages of skilled workers in times of rising business volume and prosperity.[10] As a result, more prosperous times will be accompanied with inflation and the loss of employers to foreign plant sites where essential skilled craftworkers are available and less expensive.

In a survey of state manpower needs, the North Carolina Employment Security Commission predicts a need for more than 40,000 additional carpenters, electricians, and other construction workers by 1990, of which approximately 75 percent would be for replacement of those leaving this industry because of retirement or career changes.[11] The Bureau of Labor Statistics at the U.S. Department of Labor says that a rise in construction during the 1980s will create more than 750,000 new jobs nationwide by 1990.[12] In addition, retirement or career changes on the part of journeymen craftworkers will create another 1.25 million openings.[13] The Bureau therefore estimates that, by 1990 the nation will experience a shortage of about 2,000,000 skilled workers in the construction trades, with a 40 percent increase in openings for bricklayers, a 20 percent increase for electricians, plumbers, and pipefitters, and an 18 percent increase for carpenters.[14] Consequently, if our State continues to train these artisans at today's rate, it is estimated that by 1990 there will be about 40,000 vacant jobs in North Carolina in the 18 building trades alone as a result of unavailable skilled craftworkers.

Another cause for the inadequate number of apprenticeship programs may be the State's failure to appreciate the link between apprenticeship and competitive vigor in international markets. The United States subsidizes apprenticeship to a lesser extent, and trains a smaller percentage of its skilled work force in apprenticeship programs, than do most other industrialized nations.[15]

If the United States were training apprentices between the ages of 16 and 18 at the rate at which West Germany trains them,[16] North Carolina would be training 167,000 apprentices — not 2,000! American executives who have examined the German system of apprenticeship feel that our inability to establish a system of like extent in the United States results in failure on the part of young American workers to learn basic technological skills.[17]

Most successful German manufacturers use the apprenticeship system to provide a pool of skilled, technically proficient workers so well versed in the theoretical fundamentals of their trades that they can easily master new technological processes.[18] "If the Germans have had any secret weapon during Europe's post-1973 economic difficulties, it is the technical competence of their work force, which is in turn the product of their apprenticeship system."[19]

North Carolina lacks, in large part, the equivalent of Germany's "secret weapon." This guide is part of an effort by the North Carolina Department of Labor to expand the use of apprenticeship so that it offers this State and its citizens that same kind of flexibility and protection from the world's economic frailties. With the support of employers and openly expressed concern from the public, the department can succeed in this endeavor. The department encourages the reader to join with it in establishing apprenticeship in North Carolina as the powerful skills training system that it has proven to be in other parts of the world—so that the State can reap the benefits that having a large, highly skilled work force will bring.

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[8]Sylvia Porter, "Competition Fierce for Apprenticeship," *The News and Observer*, 2 March 1983, 98.

[9]*Attitudes toward the Skilled Trades: Employment Issues in the Precision Metalworking Industry* (Louis Harris and Associates, Inc., 1982), 2, hereinafter cited as Attitudes toward the Skilled Trades.

[10]*Ibid.*

[11]Interviews with Bob Stevenson, North Carolina Employment Security Commission, 26 February 1986.

[12]"Open Shop Moves beyond Quick-fix Training," *Engineering News Record*, 2 September 1982, 24.

[13]*Ibid.*

[14]*Ibid.*

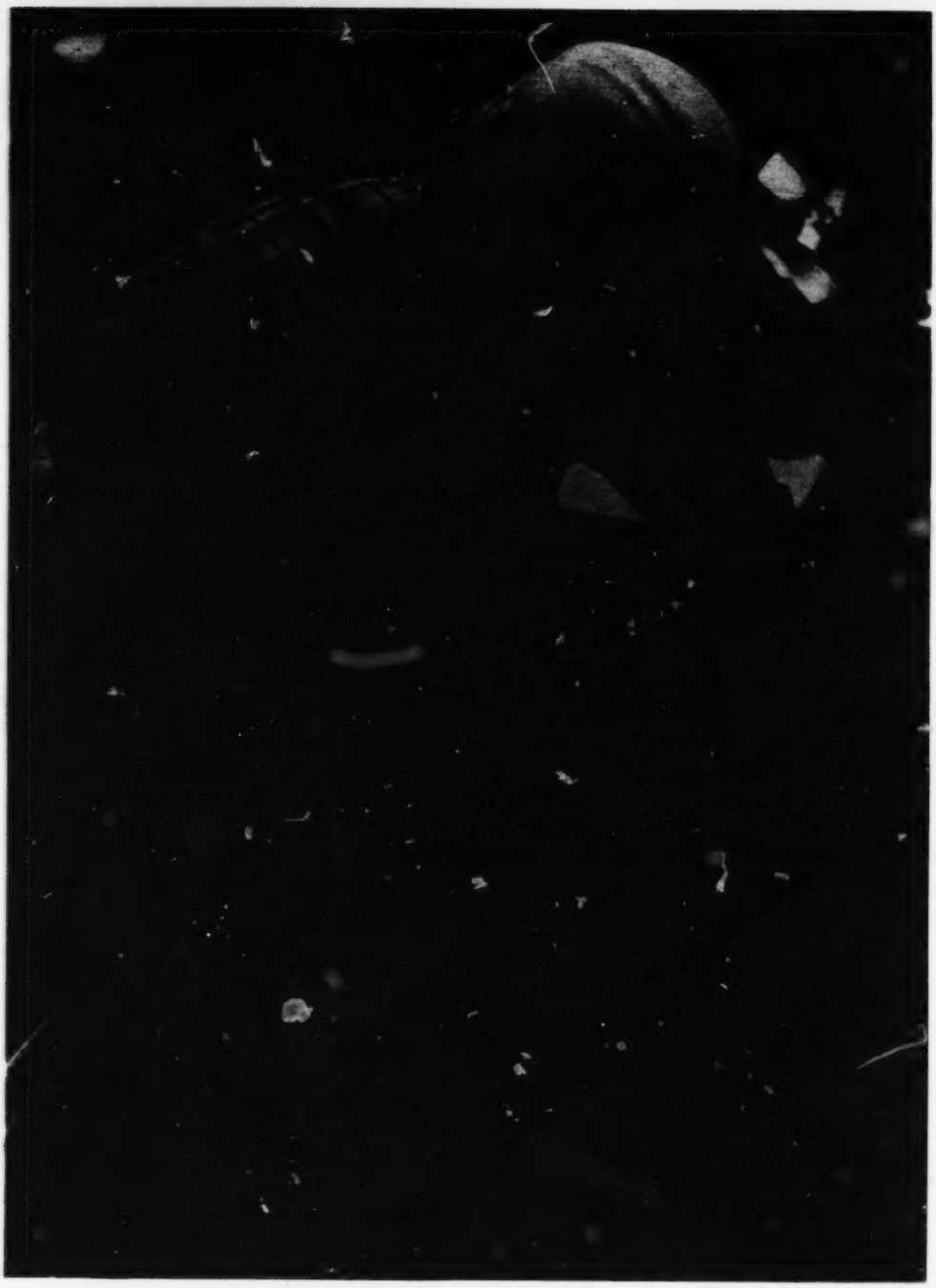
[15]*See generally* Germany's Manufacturers, 137, 140.

[16]*The Dual System: Occupational Training System in the Federal Republic of Germany* (Bonn: Deutscher Industrie and Handelstag, 1977), 6.

[17]Germany's Manufacturers, 140.

[18]*Ibid., 138.*

[19]*Ibid., 139.*



SHEET METAL WORKER
(See Occupational Description on Page 47)

PART ONE
What Is Apprenticeship?

WHAT IS APPRENTICESHIP?

Apprenticeship is the process through which individuals learn to become skilled craftworkers.

Throughout history, people have used some form of apprenticeship training to transfer skills from one generation to another. Early European settlers coming to America brought with them the practice of indenture and the system of master-apprentice relationships. This time-honored system called for an apprentice to be indentured to a "Master Craftsman" for a specified number of years. The apprentice received food, clothing, and shelter in return for work performed while learning a craft. When the period of indenture was over, the apprentice was recognized as a "journeyman" — a fully skilled independent worker.

The concept of apprenticeship, as we know it today, was institutionalized in the United States in 1937 when Congress passed The National Apprenticeship Act, popularly known as the Fitzgerald Act. The North Carolina Department of Labor is authorized by the General Statutes as the administrator of this act in North Carolina and as the accrediting agency for formal apprenticeship programs.

Definition

Modern apprenticeship is a formal, voluntary system of employee training combining on-the-job training, supervised by skilled journeyman craftworkers, with related technical instruction. A journeyman is a worker who has satisfactorily completed an apprenticeship, or has learned a trade through many years of experience on the job, and is classified as a skilled worker in a particular trade. The apprentice learns the arts and skills of the trade through on-the-job experience at the worksite.

Theory is taught through job-related courses in subjects such as drafting, blueprint reading, trade math, physical science, safety, tools and materials, welding, and basic chemistry. This technical instruction is provided either by the employer, a local community college, a technical institute, or a correspondence course.

The mixture of theory and practice offers advantages to employers and trainees alike. For trainees, apprenticeship is at once an educational scholarship and paid employment. For employers, apprenticeship not only leads to a high degree of skill in workers, but also instills in them discipline, pride of workmanship, and a sense of loyalty.

Generally recognized as the best method for teaching people to become skilled craftworkers, apprenticeship gives its trainees a number of advantages over those trained by less structured methods. Among these advantages are the opportunity to learn their trade more quickly and effectively and to work more steadily, safely, and productively.[1] On-the-job training offers apprentices another unique advantage, and that is the opportunity to learn to make decisions in a work environment that will impact on the fortunes of the employer, and furthermore, to deal effectively with the pressures of making those decisions.

Role of the North Carolina Department of Labor

The North Carolina Department of Labor serves as a catalyst and the accrediting agency for apprenticeship programs.[2] North Carolina General Statutes 94-1 to 94-11 provide that the North Carolina Department of Labor shall set up "a program of voluntary apprenticeship under approved apprentice agreements providing facilities for their training and guidance in the arts and crafts of industry and trade, with parallel instruction in related and supplementary education. . . ."[3] In endeavoring "to open to young people the opportunity to obtain training that will equip them for profitable employment and citizenship," apprenticeship representatives of the Department of Labor actively seek out employers to sponsor apprenticeship training.

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[1] United States Department of Labor, Career Guidance Magazine, "Apprenticeship Now," *Summer 1978 Occupational Outlook Quarterly* (Washington, D.C.: United States Department of Labor, 1978), p. 5. hereinafter cited as Apprenticeship Now.

[2] N.C. Gen. Stat. § 94-1 to 94-11.

[3] *Ibid.* § 94-1.

An apprenticeship representative from the North Carolina Department of Labor Apprenticeship and Training Division visits the sponsor and apprentices regularly to provide assistance and to assure that the program is operating within the guidelines of the standards of apprenticeship. Moreover, the representative assists the sponsor in improving the quality of training and in solving any training problems which may occur during the program. Once the training is completed, the North Carolina Department of Labor issues a nationally recognized Certificate of Completion to the new journeyman.

Program Operation

After considering individual employment and training needs, an employer (or group of employers) in conjunction with the North Carolina Department of Labor develops a set of "Standards of Apprenticeship." These standards include: (1) administrative practices, (2) a schedule of work processes, (3) a related instruction program, and (4) wage schedules.

Once these standards are approved by the North Carolina Department of Labor, the employer recruits employees who enter into a written apprenticeship agreement with the program sponsor. The sponsor agrees to train the employee, in accordance with the registered standards, while the employee agrees to work at assigned tasks and participate in the related instruction. During the training period, the sponsor evaluates the progress made by the apprentice on the job and in the classroom. Satisfactory progress results in wage increases for the apprentice as called for in the agreement.

Kinds of Sponsors

In order to have an apprenticeship program there must be a program sponsor. A sponsor is a single employer, a group of employers, an association, or, on occasion, a labor union which develops the standards of apprenticeship in conjunction with the North Carolina Department of Labor. Public as well as private employers may participate in apprenticeship programs, which are operated at the sponsors' expense.

Apprenticeship programs are categorized as individual or group programs. Individual programs are operated by a single employer, whereas group programs involve several employers participating in a training program operated by a committee representing the participating employers.

Associations participate in apprenticeship through the development of model training programs and by designing and implementing means of assuring that training provided by its members is consistent, complete, and of good quality. The members are employers who operate individual programs that incorporate the association's training standards and quality assurance practices, but which may have widely varying administrative practices.

Where a labor union represents the employees of an organization, programs which are established may include union participation in the administration of the program. These programs are termed "joint programs." Where the employees are not represented by a labor union, and in unionized firms where the union waives its right to participate, the programs are administered solely by the employer. These programs are termed "non-joint" programs.

Sponsors range in size from the large operation of the Federal Paper Board Company, Inc., in Riegelwood, N.C., which has a billion dollar plant with 1,425 employees and an apprenticeship program with 47 apprentices being trained by 173 journeymen,[4] to smaller companies like Day Tool and Mold of Gastonia, with an apprenticeship program consisting of three journeymen and one apprentice (tool and die maker) working out of a small shop behind a private home.

Examples of public employers that sponsor apprenticeship programs are the City of Greensboro Fire Department (firefighter), the Buncombe County Sheriff's Department (deputy sheriff), Broughton Hospital (psychiatric and medical aides), and North Carolina State University (locksmith, carpenter, and painter).

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[4]Telephone interview with E. Randolph Oglesby, Assistant Personnel Director, Federal Paper Company, Inc., Riegelwood Operation, 11 May 1983.

Kinds of Trades

APPRENTICEABLE TRADES REGISTERED
WITH THE NORTH CAROLINA DEPARTMENT OF LABOR
AS OF APRIL 1986

Building and Construction Trades

Bricklayer
Cabinet Maker
Carpenter
Cement Mason
Drafter
Electrician
Fiberglass Boat Builder
Glazier
Heavy Construction Equipment Operator
Insulator
Land Surveyor
Line Erector
Linoleum and Carpet Layer
Millwright
Painter
Pipefitter
Plumber
Reinforcing Ironworker
Sheet Metal Worker
Stained Glass Glazier
Structural Ironworker

Industrial Trades

Automotive Machinist
Cloth Cutting Machine Operator
Computer Numerical Control Machinist
Electric Discharge Machine Set-Up Operator
Electric Motor Repairer
Fork Lift Mechanic
Gage Maker
Granite Sawer (Rotary Saw)
Heavy Equipment Mechanic
Industrial Carpenter
Industrial Machine Repairer
Instrument Fitter
Knitting Machine Mechanic
Loom Fixer
Machinist
Machinist-Mechanic
Maintenance Electrician
Molder Machine Operator
Plant Maintenance Mechanic
Saw Filer
Screw Machine Operator
Sheet Metal Fabricator
Tool and Die Maker
Warehouse Manager
Water Plant Operator
Welder

Service Trades

Aircraft Mechanic
Auto Body Repairer
Auto Mechanic
Automotive Mechanic
Awning Maker
Baker
Business Machines Mechanic
Cook, Hotel and Restaurant
Dental Technician
Diesel Mechanic
Dry Cleaner
Electric Appliance Servicer
Electrical Instrument Repairer
Electronic Technician
Environmental Control Systems Installer/Servicer
Farm Equipment Mechanic
Farm Supervisor
Fast Food Restaurant Manager
Floral Designer
Front End Mechanic
Fuel Injection Servicer
Funeral Service (Embalmer)
Furniture Upholsterer
Gas Appliance Servicer
Gunsmith
Health Care Technician (Medical)
Health Care Technician (Psychiatric)
Installer Technician (Cablevision)
Jeweler
Landscape Gardener
Marine Equipment Mechanic
Meat Cutter
Motorboat Mechanic
Motorcycle Mechanic
Office Machine Repairer
Offset Press Operator
Optical Technician
Optician
Parts Clerk
Photo Stripper
Photographer
Photolithographer
Photo Retoucher
Phototypesetter Operator
Printing Press Operator
Radio Repairer
Radio Television Repairer
Refrigeration Mechanic
Rotogravure-Press Operator
Sewing Machine Repairer
Sheet Metal/Air Conditioning Mechanic
Sign Technician
Surgical Technician
Traffic Signal Repairer
Truck and Trailer Body Repairer
Vending Machine Mechanic
Web Press Operator
X-Ray Technologist

Public Employment Trades

Deputy Sheriff
Fire Medic
Firefighter
Police Officer
Public Safety Officer

Length of Programs

The minimum length of an apprenticeship program is 2000 hours or one year, under North Carolina General Statute 94-6 and 13 NCAC 14, section .0204(a)(5)(B).

Most apprenticeship programs are four years in length, although programs vary from one year to six years. G.S. 94-6 requires a minimum of 144 hours of related instruction for each 2,000 hours of on-the-job training, but some employers require or provide substantially more. Apprentices studying to become pipefitters at Federal Paper Board, for instance, must devote about 225 hours a year to related instruction.

Trades represented include not only those in the mainstream of the construction and metal working industries, but also many specialized occupations, such as emergency medical technician, locksmith, butcher, farm equipment mechanic, industrial hygienist, photoengraving retoucher, dental laboratory technician, and programmer for numerically controlled, multiple spindle drill machines.

While most apprenticeship programs are time-based and provide training that is measured in terms of time spent in on-the-job training and time spent in related training, some programs have applied the new performance-based (or competency-based) methodology to their training plans. In performance-based training, the various aspects of the occupation to be learned are each identified in terms of what must be learned on the job and in related instruction and arranged in logical sequence. Apprentices then spend the time needed to become proficient in one aspect and move on to the next as soon as proficiency is demonstrated, thus allowing them to advance through the program at their own pace. Examples of performance-based programs are those registered for Kelly-Springfield Tire Company in Fayetteville (maintenance machinist, instrument repairer, general craftworker) and Meredith-Burda Corporation in Newton (machinist, rotogravure-press operator, book binder machine operator, electrician, photo retoucher, re-etcher, electronic engraver technician, photographer, cylinder plater technician, cylinder maker, photo stripper, and stripper technician).

Whether the design of the particular program is time-based or competency-based, the apprentice completes the program only when the sponsor certifies to the North Carolina Department of Labor that the apprentice has achieved the proficiency required and has met all of the requirements to be designated a "journeyman craftworker," and the North Carolina Department of Labor determines that the apprentice has satisfactorily completed all of the required related instruction and has complied with all of the State's attendance requirements.

Related Instruction

The related instruction that is required for registered apprenticeship programs must be fundamentally related to the craft. Such courses include blueprint reading for welders, trigonometry for machinists and sheet metal workers, and hydraulics for maintenance mechanics. The required minimum related instruction may not include basic educational courses such as arithmetic, English, or communication skills.

Traditionally, the related instruction required for apprenticeship programs has been furnished by correspondence courses. These are often considered less than satisfactory, although in many instances they continue to be the only related instruction available to particular program sponsors or apprentices.

The most prevalent method of providing apprentices with required related instruction is for the sponsor to furnish classes for the apprentices in the evening or on Saturday mornings. For instance, apprentices in one machinist program spend three hours in class two evenings a week.[5] Some instrument repairer apprentices spend about ten hours a week on homework.[6] One employer drills his air-conditioning technician apprentices in algebra as they drive from job to job.[7] Others furnish instruction in company or management/union training centers.[8] Related instruction training materials represent a valuable

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[5]Interview with Gerald Dixon, Square D Company apprentice, 1 February 1983.

[6]Telephone interview with Yvonne Ratchford, Kelly-Springfield Tire Company apprentice, 18 April 1983.

[7]Telephone interview with Philip J. Bisesi, founder of Affiliated Technical Services, Inc., Greensboro, testing engineer, 10 February 1983.

[8]*E.g.* Kelly-Springfield Tire Company, Fayetteville; Federal Paper Board Company, Inc., Riegelwood Operation.

resource for apprentices, as indicated by one mechanical maintenance training program offered on the open market that contains 51 tapes at $795 each, for a total of about $40,500.[9]

Increasingly, the preferred method for providing apprentices with high-quality related instruction is for the instruction to be provided by community or technical colleges or technical institutes. These schools can provide either (1) the preferred classroom instruction, where an economically large enough class can be assembled; or (2) audiovisual self-training materials in supervised learning labs; or (3) courses that are part of an already established degree or diploma program.

However, difficulty is still broadly encountered in seeking to have the required related instruction furnished by the community college system. Many community and technical colleges and technical institutes in North Carolina do not have the needed related instruction curricula in place. Also, they often do not have faculty capable of teaching these courses. Audiovisual self-training materials for apprenticeable occupations are also largely nonexistent in many of these institutions. Apprenticeship representatives from the North Carolina Department of Labor are available to assist sponsors of an apprenticeship program in arranging for an appropriate form of the required related instruction for their apprentices.

Apprentices may be required to pay for related instruction at technical schools, but most sponsors pay for their apprentices' tuition.[10] As technologies continue their rapid rate of change, apprentices must make an increasingly serious commitment to study, as must journeymen. *A journeyman is a craftworker who is perceived as a professional in his field.* This means that the craftworker will strive to stay abreast of the technological changes that occur.

[9]"Equipment Operation Training: A Complete Videotape Industrial Skills Training Program from ITC" (Rockville, Md.: Industrial Training Corporation, 1982).

[10]Interview with James Schulist, Manager Manufacturing-Engineering, Square D Company, Knightdale, 20 May 1983.

Hands-On-Training

All sponsors are alike in offering apprentices the opportunity to learn on the job how to operate expensive, up-to-date equipment that could not be readily matched by public or private technical schools. Even a small North Carolina machine shop, for instance, may own a $184,000 computer numerically controlled (CNC) machine. At that cost this machine is clearly beyond the means of most schools.

The hands-on training, or on-the-job training, in apprenticeship is laid out for the apprentice in the schedule of work processes in the program sponsor's Standards of Apprenticeship. No apprenticeship program may have less than 2,000 hours (one normal work year) of on-the-job training, although the most common length of time is 8,000 hours (four normal work years).

Throughout the time spent in learning an occupation on-the-job, the apprentice is supervised and taught by a fully qualified worker, called a journeyman. The journeyman is responsible for assuring that the apprentice learns to perform the tasks of the occupation in a safe, accurate, and efficient manner. The journeyman teaches the apprentice "tricks of the trade" that allow the apprentice to do the job well and in the way the employer wants it to be done.

Apprentices learn to apply the knowledge learned in related instruction through the training they receive on the job. They will spend nine to ten times as many hours learning while working than in related instruction, and in the minds of most people involved in apprenticeship, the on-the-job training is the more important of the two kinds of training an apprentice receives.

Hands-on training on the job is the traditional heart of apprenticeship. For most of the four-thousand-year history of apprenticeship, it was the only job-related training an apprentice received. It is the setting where the apprentice learns to do, not just to think about doing, a job. It is the difference between being trained in a school to enter a job and being trained to the level of a journeyman who is fully qualified to perform all of the tasks that make up that job.

Wages

Generally, apprentices who are beginning their training in a trade receive about 50 percent of the journeyman wage. In no case may this be below the minimum wage. For apprentices who receive credit for previous on-the-job experience from their sponsors, beginning wages run higher, reflecting that experience. Thereafter, apprentices receive progressive pay increases, which are tied to improvement in trade skills as reflected by satisfactory performance on the job and in related instruction. Upon completion of the program, an apprentice is entitled to receive a journeyman's wage. The table which appears in Appendix A provides data on 1986 journeyman wages for newly completed apprentices in North Carolina.

Veterans

Veterans with remaining eligibility for educational benefits under federal law may receive benefits payments for participation in an approved apprenticeship or other on-the-job training program. Veterans seeking benefits should apply for them through their county veterans' services officer. A certification by the veteran and the employer is required in advance of the issuance of each monthly benefits check. The law providing veterans with training benefits for apprenticeship and other on-the-job training expires on September 30, 1989.

Age

Apprentices must be at least 16 years of age.[11] Most sponsors, however, set the minimum age at 18, which is the minimum age for employee coverage under most insurance policies and after which there are no special youth provisions under federal and state wage and hour laws.[12]

Educational Levels

Although most employers require apprentices to have either a high school diploma or its equivalent, minimum educational requirements vary among sponsors. Completion of the eighth grade may be enough in the case of employees who have already proven themselves in other jobs and seek promotion through apprenticeship. In general, however, educational levels of apprentices have risen steadily, with recent increases in the number of apprentices with college educations. A number of employers stress the importance of a good background in math, with coursework in algebra and trigonometry now a requirement for some apprenticeships. Sponsors indicate, however, that few applicants are qualified in this regard. For instance, of 590 applicants for the apprenticeship program at Kelly-Springfield Tire Company in Fayetteville, only 80 passed the required pre-employment test, with math as the biggest problem for those who failed.[13] Similarly, spokesmen for the construction industry express surprise at the small number of applicants who can take accurate measurements.

The North Carolina Administrative Code states the following with regard to minimum qualifications of apprentices:

.0203 MINIMUM QUALIFICATIONS OF APPRENTICES

(a) An apprentice must have the following qualifications:
  (1) He must be at least 16 years old, except where a higher minimum age is otherwise fixed by law; and
  (2) He must not be fully trained or qualified in the trade or occupation offered in the apprenticeship program in which he is to be trained; and
  (3) He must be a high school "completer," high school graduate, must have passed an equivalency examination, or, with the approval of the director, he may be a high school student enrolled in a course of study leading toward graduation. A sponsor may apply to the director for waiver of this rule for an individual apprenticeship applicant, or an individual craft or trade.

(b) Additional minimum qualifications for apprentices may be established by the sponsor so long as the additional qualifications comply with Section .0800 of this Chapter concerning equal employment opportunity.

History Note: Statutory Authority G.S. 94-1; 94-2; 94-6; Eff. February 1, 1984.

[11]N. C. Gen. Stat. § 94-6.

[12]Apprenticeship Now, p. 9.

[13]Sylvia Porter, "Competition Fierce for Apprenticeship," *The News and Observer*, 2 March 1983, p. 9B. Apprenticeship Now, p. 9.

Costs

Apprenticeship training is financed by the employer who sponsors an apprenticeship program. While it is difficult to place an exact cost on apprentice training, it is easy to arrive at an amount in the vicinity of $50,000 for a typical four-year apprenticeship program, when costs such as apprentice wages, training materials, instruction costs, and lost production are considered.

Some employers may worry that they will go to the expense of training apprentices only to have them enticed away, once trained, by other employers.[14] Studies show, however, that more than half of the skills learned in apprenticeship are company-specific.[15] Other reports indicate high retention rates for most employers.[16] Since apprentices become increasingly skilled and able to work on their own, and their productivity steadily increases, costs of training individual apprentices gradually decrease. A number of employers have estimated that by the end of the first year of apprenticeship they began to recover a profit on their apprentices.[17] One employer estimated that often in the third year of a four-year program and sometimes as early as the second year, apprentices begin to take the lead from journeymen in solving problems.[18]

Record-Keeping Requirements

The North Carolina Department of Labor keeps the documentation required of employers to a reasonable level. Generally, sponsors must provide the same documentation that they would prepare for any training program as a matter of good business practice. If sponsors lack forms of their own, the department furnishes them. The required record-keeping is not burdensome.

The department requires the sponsor to document the apprentices' wage schedules, work processes, and related instruction requirements in a set of apprenticeship training standards which are tailored to the sponsor's needs. The department reviews the standards, approves or disapproves them, and returns them to the sponsor, while retaining a copy in the department. The department also requires the sponsor to record the completion of each work process, and each instructor of related instruction to certify each apprentice's attendance at and satisfactory completion of each module of the curriculum. Copies of the related instruction records are to be sent to the department on a regular basis for entry into a computerized apprentice "transcript."

Apprenticeship Agreements

In their agreements with apprentices, sponsors promise to place and train registered apprentices in the trades specified. Apprentices, for their part, promise to perform their work and studies faithfully and diligently throughout the term of their apprenticeship. In order for sponsors and the Apprenticeship and Training Division of the North Carolina Department of Labor to evaluate apprentices' progress, apprentices waive their rights under 20 USCA S1232g(b), allowing educational institutions to disclose apprentices' grades and attendance records to sponsors and to the division without further permission from the apprentices.

The agreement gives apprentices the right to review copies of the standards of apprenticeship during business hours and the "right to notice" of proposed revisions at least two weeks before sponsors are to submit the proposals to the Apprenticeship and Training Division for approval and registration. Sponsors agree to accept and duly consider apprentices' written comments on the proposals so long as they are received one week before the date for submission. Apprentices attest to having read the standards and promise to abide by them.

During the probationary period for apprentices, usually the first 500 hours, but not more than four months of employment, either party may dissolve the agreement upon written request to the director of apprenticeship of the North Carolina Department of Labor.[19] After that, the apprentice alone, or both parties acting together, may dissolve the agreement at will.[20] The sponsor alone may dissolve the agreement upon a showing of

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[14]Joseph A. Limprecht and Robert H. Hays, "Germany's World-Class Manufacturers," *Harvard Business Review* (November-December 1982), 140.
[15]*Ibid.*, p. 143.
[16]*Ibid.*, p. 140.
[17]Johann Hofschuster to Jack Crumpton, 25 April 1983.
[18]Oglesby interview *supra* note 4.

[19]Labor Standards for the Registration of Apprenticeship Programs, 29 C.F.R. S 29.6(h)(2) (1982).
[20]*Ibid.*

good and sufficient reason. Common reasons for a person seeking to dissolve an apprentice's agreement are failure to attend or pass related instruction courses, failure to progress satisfactorily in learning the required on-the-job skills, or infractions of the sponsor's work rules.

The Department of Labor's quality assurance representatives conduct annual reviews of programs with five or more registered apprentices, and five-year reviews of programs with fewer than five registered apprentices. The experience of the department has been that sponsors welcome the opportunity for consultation about the quality of their programs. On these occasions and during visits by regular field representatives, apprentices are free to discuss problems that they choose not to discuss with the employer, despite the employer's interest in knowing about and remedying such problems. Sponsors report that the department's objective review of their programs boosts apprentices' morale.

Certificate of Completion

Upon the successful conclusion of training, the apprentice receives a nationally recognized *Certificate of Completion* from the North Carolina Department of Labor, bearing the State seal. Certificates of completion are a source of pride to apprentices and have proven to be of great practical value to them in seeking employment. Certification of an apprentice's completion and proficiency is furnished to the Department of Labor by the sponsor, and the department verifies the apprentice's satisfactory completion of the required related instruction and compliance with the State's attendance laws.

Equal Employment Opportunity

Sponsors agree to select and train apprentices without discrimination as to race, color, religion, national origin, or sex; and to take affirmative action to provide equal employment opportunity in accordance with the Equal Employment Opportunity Standards published by the United States Secretary of Labor,[21] and with the terms of the relevant rules promulgated by the North Carolina Department of Labor. The North Carolina standards on nondiscriminatory selection and training of apprentices parallel the language of Title VII of the Civil Rights Act of 1964.[22]

By using apprenticeship agreements, sponsors may provide themselves with a measure of protection against civil actions under Title VII. The Title VII provisions have established a basis in other settings for an enormous amount of litigation as members of disadvantaged minorities seek greater representation in the work force,[23] but the occasion of litigation by apprentices against program sponsors is rare, at least in part because of the clear and simple equal employment opportunity requirements for apprenticeship and the periodic review of programs that identify problems before they become serious.

By complying with the standards, at least one North Carolina employer has successfully defended against a Title VII action for discrimination with regard to the rest of his work force. Noting the employer's conscientious effort to promote equal opportunity in his apprenticeship program, the court thought it unlikely that he could have intended to discriminate elsewhere. The Department of Labor apprenticeship representatives have been able to alert sponsors to situations that may expose them to employment discrimination litigation.

Women in Apprenticeship

Nationally, the number of women choosing to become apprentices is on the rise. This reflects the public's changing attitudes concerning women in the work force. Each decennial census from 1900 to 1960 shows women holding only two to three percent of the jobs in the skilled trades. This figure varied only during World War II. By 1982, however, the number of women in the skilled trades had more than doubled to nearly six and one-half percent. Today, women account for nearly a million skilled craftworkers.

It has been reported that nationwide there are women employed in all of the skilled trades. These include such traditionally "men's" jobs as automobile mechanics, carpentry, heavy equipment mechanics, telephone

[21] Equal Employment Opportunity in Apprenticeship and Training, 29 C.F.R. S 30.3 (1982).

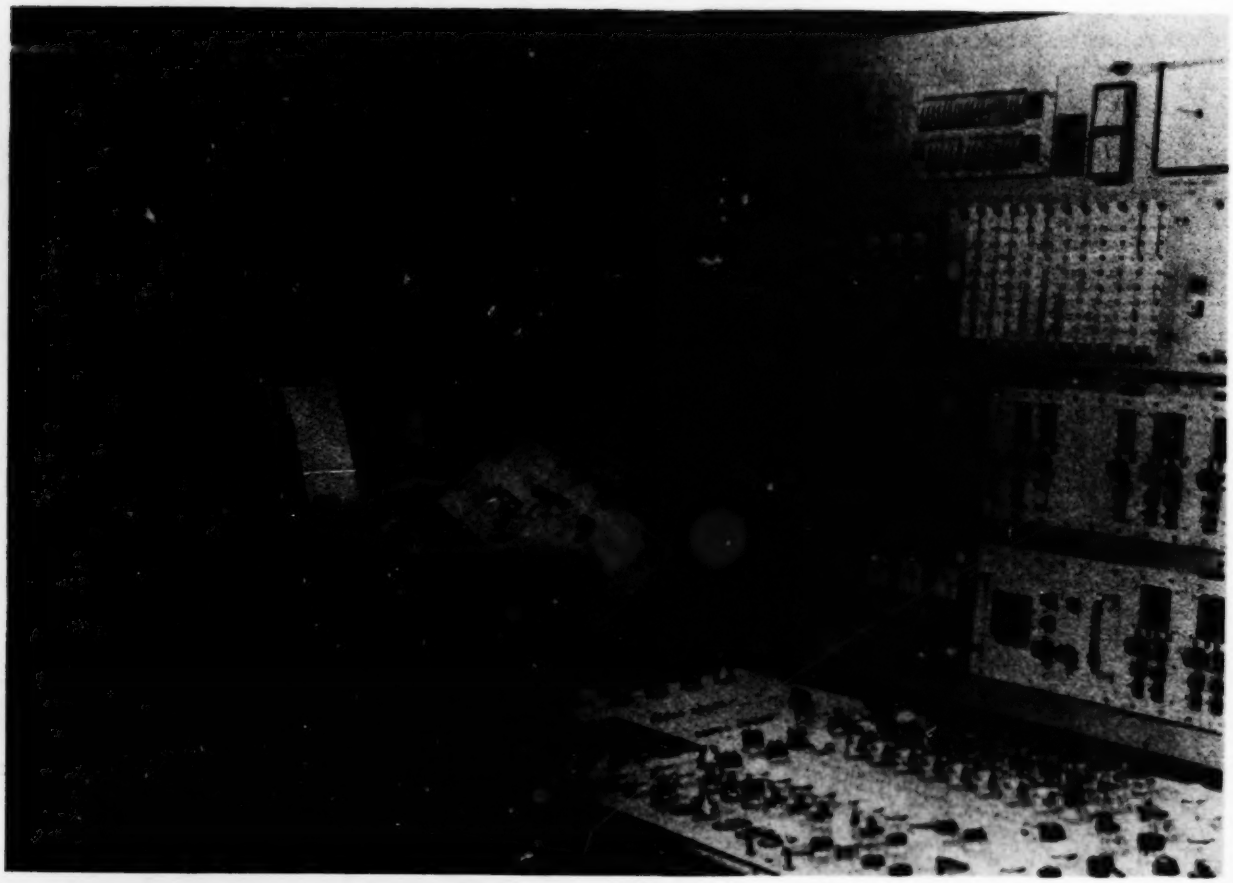
[22] Civil Rights Act of 1964, 42 U.S.C. S2000.e. (1976 & Supp. V 1981).

[23] William P. Murphy, Paul B. Eaton Professor of Law, University of North Carolina School of Law, was the source for the statement on enormous amount of title VII litigation; interview 20 June 1983.

installation and repair work, police work, firefighting, and electrical work. In North Carolina, women participate in apprenticeship programs at about the same rate as the percent of women in skilled trades nationally. While they comprise about 45 percent of the total work force in the State,[24] they represent only about seven percent of the people currently enrolled in apprenticeship programs.

One overriding explanation for the low number of women in apprenticeship in our State is that many women are probably unaware of the apprenticeship opportunities available to them. Female students interested in the skilled crafts should discuss the availability of apprenticeship opportunities with their parents, teachers, and high school guidance counselors. Women already employed in the work force should make their employers aware of their interest in apprenticeship.

[24]Telephone interview with Floyd Outland, Employment Security Division, Labor Market Information Division, 21 June 1983.



ROTOGRAVURE PRESS OPERATOR
(See Occupational Description on Page 45)

PART TWO

The Twenty Skilled Trades Enrolling the Greatest Number of Apprentices in North Carolina

AUTOMOBILE MECHANIC

Job Description

Automobile mechanics raise vehicles using a hydraulic jack or hoist to gain access to mechanical units bolted to the underside. They remove units, such as engines, transmissions, or differentials, using wrenches and hoists. Disassemble units and inspect parts for wear, using micrometers, calipers, and thickness gages. Repair or replace parts, such as pistons, rods, gears, valves, and bearings, using mechanic's hand tools. Overhaul or replace carburetors, blowers, generators, distributors, starters, and pumps. Rebuild parts, such as crankshafts and cylinder blocks, using lathes, shapers, or drill presses, and welding equipment. Rewire ignition systems, lights, and instrument panels. Reline and adjust brakes; align front ends; repair or replace shock absorbers; and solder leaks in radiators.[1]

When mechanical or electrical troubles occur in a car or truck, automobile mechanics first get a description of the symptoms from the owner, or, if they work in a dealership, from the service advisor who wrote the repair order.[2] The mechanic may have to test drive the car or use testing equipment, such as motor analyzers, spark plug testers, or compression gages, to locate the problem. Once the cause of the problem is found, mechanics make adjustments or repairs. If a part cannot be fixed, they replace it.

Most automobile mechanics perform a variety of repairs. Others specialize in hydraulic pumps, and other parts of automatic transmissions. Tune-up mechanics adjust the ignition timing and valves, and adjust or replace spark plugs, distributor points, and other parts to ensure efficient engine performance. Automobile air-conditioning mechanics install air-conditioners and service components such as compressors and condensers. Front-end mechanics align and balance wheels and repair steering mechanisms and suspension systems.[3] Brake mechanics adjust brakes, replace brake linings, repair hydraulic cylinders, and make other repairs on brake systems. Some mechanics specialize in both brake and front-end work. Automobile-radiator mechanics clean radiators with caustic solutions, locate and solder leaks, install new radiator cores and may also repair heaters and air-conditioners, and solder leaks in gasoline tanks.[4] Automobile-glass mechanics replace broken windshield and window glass and repair window operating mechanisms.[5]

Entrance Requirements

A high school diploma or equivalent is recommended.[6] Instruction in such high school courses as automobile repair, physical science, and mathematics is helpful.[7]

Training Period

The apprenticeship program consists of 8,000 hours of on-the-job training and at least 144 hours of related instruction for each 2,000 hours of on-the-job training. "On-the-job training includes instruction in basic service procedures, such as engine tune-up, as well as instruction in special procedures, such as overhauling transmissions. Related instruction includes courses in related theory such as mathematics and physics and other areas such as shop safety practices and customer relations."[8]

Working Conditions

Generally, automobile mechanics work indoors. Most repair shops are well ventilated, lighted, and heated.[9] "Mechanics frequently work with dirty and greasy parts, and in awkward positions. Many of the automobile parts and tools that they must lift are heavy. Minor cuts and bruises are common, but serious accidents can be avoided by keeping the shop clean and orderly and by observing other safety practices."[10]

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 620.261-010, p. 536.

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 335.

[3]*Ibid.*

[4]*Ibid.*

[5]*Ibid.*

[6]Interview with Tommy Owenby, service manager, Al Smith Buick, 22 June 1983.

[7]*Occupational Outlook Handbook*, p. 336, *supra* note 2.

[8]*Ibid.*

[9]*Ibid.*, p. 335.

[10]*Ibid.*, pp. 335-6.

AUTOMOBILE MECHANIC (Continued)

Opportunities for Women

Many women nationwide have become successful automobile mechanics. Women interested in automotive repair should have no difficulty in becoming successful mechanics.

Tools and Equipment

Automobile mechanics need an assortment of over 90 hand tools, including electrical tools like air wrenches and sockets. The minimum price range is from $3,000 to $5,000. Some mechanics, however, have spent as much as $10,000 to $12,000 on their hand tools and toolbox.

Upward Mobility

Automobile mechanics may advance to such positions as supervisor and service manager. Some go into business for themselves by opening their own automotive repair shops.[11]

Job Outlook

Automobile mechanics may find jobs not only in the service departments of car dealers and in automotive repair shops, but also in the service departments of large companies and governmental agencies that maintain their own automotive vehicles. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 37,000 automobile mechanics will be needed annually nationwide until 1990 to fill the job market needs for their services.[12]

For More Information

National Institute for Automotive Service Excellence
1825 K Street, NW
Washington, D.C. 20006

Automotive Service Industry Association
444 North Michigan Avenue
Chicago, Illinois 60611

Automotive Service Councils, Inc.
188 Industrial Drive
Suite 112
Elmhurst, Illinois 60126

National Automobile Dealers Association
8400 Westpark Drive
McLean, Virginia 22102

Independent Garage Owners of North Carolina, Inc.
Post Office Box 3105
Raleigh, North Carolina 27628 (919) 782-1560

North Carolina Service Station Association
Post Office Box 2211
Raleigh, North Carolina 27602 (919) 821-1403

[11]Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

[12]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 63.

BRICKLAYER

Job Description

Bricklayers measure out guidelines on working surfaces and spread soft mortar with trowels to provide binder and base for bricks. They apply mortar to the end of bricks and place them in mortar beds; tap bricks with trowels to level, align, and embed them in mortar, allowing the specified thickness of joint; remove excess mortar with trowels; finish mortar between bricks with pointing tools; and determine vertical and horizontal alignment of courses, using plumb bobs, gagelines (tightly stretched cord), and levels.[1]

Bricklayers build walls, partitions, fireplaces, and other structures with brick, concrete block, and other masonry materials and also install firebrick linings in industrial furnaces.[2] "In putting up a wall, bricklayers first build the corners at each end of the wall, using plumblines and a level. A line then is stretched from corner to corner as a guide for each course or layer of brick. Bricklayers spread a bed of mortar with a trowel, place the brick on the mortar bed, and then tap it into place. As blueprints specify, they cut bricks with a hammer and chisel to fit around windows, doors, and other openings. Mortar joints are finished with jointing tools to leave a neat and uniform appearance. Bricklayers also may use steel supports at window and door openings."[3]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in high school courses such as bricklaying, mathematics, and mechanical drawing is helpful.[4]

Training Period

The apprenticeship program normally requires 6,000 hours of on-the-job training and 144 hours of related instruction in such subjects as blueprint reading, mathematics, layout work, and sketching for each 2,000 hours of on-the-job training. Apprentices begin their training by carrying materials and mixing mortar. Within two or three months, they learn to align, lay, and clean brick.[5]

Working Conditions

Usually working outdoors, bricklayers must stand, kneel, or stoop for long periods and may have to lift heavy materials to complete a job. They are also subject to injuries from tools and falls from scaffolds. Despite the physical demands and general hazards of construction, bricklayers are less likely to be injured than other construction workers.[6]

Opportunites for Women

Apart from an occasional need to do some heavy lifting, the work presents no particular difficulties for women. In fact, a number of women are now working as successful bricklayers in North Carolina.

Tools and Equipment

Bricklayers need a trowel, jointer (for smoothing out the mortar line), level, brush, hammer, rule, and a standard canvas masonry bag in which to carry these tools. The total cost of these items should be about $90.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 861.381-018, p. 858.

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 211.

[3]*Ibid.*

[4]*Ibid.*, p. 212; telephone interview with Robert Royal, local coordinator for the Carolinas Construction Training Council for Raleigh, Goldsboro, Wilson, and Rocky Mount, 9 March 1983.

[5]*Occupational Outlook Handbook*, p. 212, *supra* note 2.

[6]*Ibid.*

BRICKLAYER (Continued)

Upward Mobility

Unlike electricians, plumbers, pipefitters, carpenters, and environmental control systems installers/servicers, bricklayers are not required to take a qualifying examination to become contractors in their trade. The North Carolina Licensing Board of General Contractors currently has under consideration a plan to institute such an examination, as they are authorized to do by the North Carolina General Statutes. They are, however, uncertain that they will be able to formulate questions to cover the technical aspects of the craft.[7]

Job Outlook

Prospects for employment are especially good in North Carolina where brick is a major product and often favored by builders. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 6,200 bricklayers will be needed annually nationwide until 1990 to fill the job market needs for their services.[8]

For More Information

Bricklayers, Masons, and Plasterers' International Union of America
815 15th Street, NW
Washington, D.C. 20005

Associated General Contractors of America, Inc.
1957 E Street, NW
Washington, D.C. 20006

Brick Institute of America
1750 Old Meadow Road
McLean, Virginia 22101

North Carolina Mason Contractors' Association
3733 Benson Drive
Raleigh, North Carolina 27609 (919) 872-2224

Brick Association of North Carolina
Post Office Box 6305
Greensboro, North Carolina 27405 (919) 273-6305

Carolinas Concrete Masonry Association
Post Office Box 7875
2306 West Meadowview Road
Greensboro, North Carolina 27407

[7]Telephone interview with H.M. McCown, secretary-treasurer of the North Carolina Licensing Board for General Contractors, Raleigh, 3 March 1983.

[8]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980, Bulletin 2052, p. 47.

CARPENTER

Job Description

Carpenters study blueprints in order to select specified materials, prepare layouts, and mark cutting and assembly lines on materials. They verify trueness of structure with plumb bobs and carpenter's levels; erect framework; lay subflooring; build stairs; lay out and install partitions and cabinetwork; cover subfloor with building paper; lay hardwood or other floors; install paneling; and fit and install prefabricated windows, doors, and interior and exterior trim. Construct forms and chutes for pouring concrete. May weld metal parts to steel structural members.[1]

In the construction industry, carpentry commonly is divided into two categories — rough and finish. Examples of rough carpentry include building house frameworks, scaffolds, and wooden forms for concrete, as well as erecting docks, bridges, and supports for tunnels and sewers. Finish carpentry includes building stairs, installing doors, cabinets, wood paneling and molding, and putting up acoustical tiles. In finish carpentry, appearance is just as important as structural integrity. Skilled carpenters do both rough and finish work.

"The duties of carpenters vary even within the broad categories of rough and finish carpentry. The type of construction, size of the company, skill of the carpenter, community size, and other factors affect the carpenter's work. A carpenter who is employed by a large contractor, for example, may specialize in laying hardwood floors, while one who is employed by a small contractor may build wall frames, put in insulation, install paneling, and even paint."[2]

"Working from blueprints, instructions from supervisors, or both, carpenters first do the layout — measure the area and the materials. Local building codes may dictate what materials have to be used for certain jobs and carpenters may have to know these requirements. Wood or other material is cut or shaped with hand and power tools, such as saws and drills. Carpenters then join the materials with nails, screws, or glue. They check the accuracy of their work with levels, rulers, and framing squares. Carpenters not employed in the construction industry usually do installation and maintenance work."[3]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as carpentry, shop, mechanical drawing, and general mathematics is helpful.[4] Applicants should be in good physical condition.

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training. On the job, apprentices learn elementary structural design and become familiar with common carpentry jobs such as form building, rough framing, and outside and inside finishing. They also learn to use the tools, machines, equipment, and materials of the trade. Apprentices receive related instruction in blueprint reading and freehand sketching, basic mathematics, safety, first aid, and different carpentry techniques.[5]

Working Conditions

"As in the other building trades, the carpenter's work is active and sometimes strenuous. Prolonged standing, climbing, and squatting often are necessary."[6] The routine use of such safety equipment as hardhats and safety goggles protects carpenters from the hazards of the construction site.

Opportunities for Women

Women nationwide have made a place for themselves in most construction fields, including carpentry. Interested women in good physical condition should have no difficulty in becoming carpenters.

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[1] United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 860.381-042, p. 856.

[2] United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 213.

[3] *Ibid.*

[4] *Ibid*, p. 214.

[5] *Ibid.*

[6] *Ibid.*, p. 213.

CARPENTER (Continued)

Tools and Equipment

Carpenters need a hammer, rule, framing square, hand saw, and other hand tools, which will cost about $100. Construction companies usually furnish power tools.

Upward Mobility

Carpenters, with experience and additional training, may be promoted to supervisor, construction supervisor, superintendent, or estimator. Some take the State licensing examination to become general contractors.[7] "Carpenters usually have greater opportunities than most other construction workers to become general construction supervisors or contractors because they learn more about the entire construction process in their work."[8]

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 58,000 carpenters will be needed annually nationwide until 1990 to fill the job market need for their services.[9]

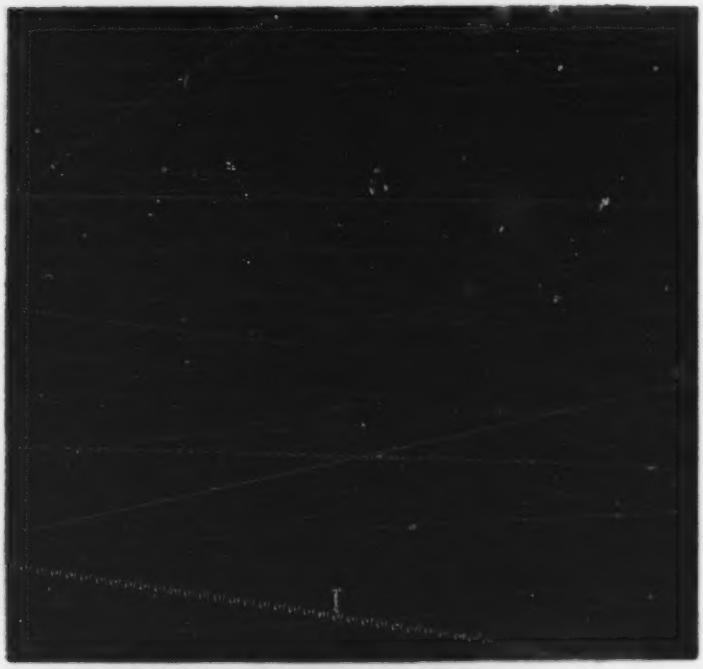
For More Information

United Brotherhood of Carpenters
and Joiners of America
101 Constitution Avenue, NW
Washington, D.C. 20006

National Association of Home Builders
Manpower Development and Training Department
15th Street, NW
Washington, D.C. 20005

Associated Builders and Contractors, Inc.
444 North Capitol Street, NW
Suite 409
Washington, D.C. 20001

Associated General Contractors of America, Inc.
Carolinas Branch
Post Office Box 30277
Charlotte, North Carolina 28230



[7]Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

[8]*Occupational Outlook Handbook*, p. 214, *supra* note 2.

[9]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 47.

ELECTRICIAN

Job Description

Electricians plan out, diagram, install, and repair electrical fixtures, apparatus, and control equipment such as switches, relays, and circuit breaker panels. They measure, cut, bend, thread, assemble, and install electrical conduit (pipe or tubing); and pull wiring through conduit. They test continuity of circuits to insure compatibility and safety of components, using such instruments as the ohmmeter, battery and buzzer, and oscilloscope.[1]

Heating, lighting, power, air-conditioning, and refrigeration components; electrical machinery; electronic equipment and controls; and signal and communication systems all operate through electrical systems that are assembled, installed, and wired by electricians. Following blueprint specifications for most installations, electricians install wiring in factories and offices by first bending, fitting, and fastening conduit (pipe or tubing) inside partitions, walls, or other concealed areas. Small metal boxes that will house electrical devices such as switches and outlets are also fastened to the wall.[2]

To complete the circuits between outlets and switches, electricians pull insulated wires or cables through conduits, working carefully to avoid damaging any wires or cables. In housing construction, plastic covered wires are usually used rather than conduits. In either case, electricians connect the wiring to circuit breakers, transformers, or other components and join wires by twisting the ends together with pliers and covering the ends with special plastic connectors. If this connection requires additional strength, electricians use an electric soldering gun to melt metal onto the twisted wires, and then cover them with durable electrical tape. When the wiring is finished, they test the circuits for proper connections with the use of such instruments as an ohmmeter and an oscilloscope.[3]

For safety, electricians must also be able to master the more than 800 detailed sections of the National Electrical Code, designed to protect persons and property from hazards arising from the use of electricity.

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as algebra and physics is helpful. Applicants must also have good color vision in order to work with color-coded wiring.

Training Period

The apprenticeship program normally requires 8000 hours of on-the-job training and includes related instruction in trade theory and practices. Apprentices must take at least 144 hours of related instruction for each 2000 hours of on-the-job training in which they learn blueprint reading, electrical theory, electronics, mathematics, first aid, and safety practices.[4]

On-the-job training consists of practical experience under the supervision of experienced electricians. "At first, apprentices drill holes, set anchors, and set up conduits. After gaining experience, they measure, bend, and install conduits, as well as install, connect, and test wiring. They also learn to set up and draw diagrams for entire electrical systems."[5]

Working Conditions

Electricians are not required to have great physical strength, but they frequently must stand for long periods and work in cramped and uncomfortable positions. Since much of their work is indoors, electricians are less exposed to unfavorable weather than are most other construction workers. Although they risk electrical shock, good safety practices have reduced the occasion of injuries.[6]

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[1] United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 824.261-010, p. 838.
[2] United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 219.
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*
[6] *Ibid.*

ELECTRICIAN (Continued)

Opportunities for Women

Very little about this occupation should deter women interested in becoming electricians. In fact, a number of women are now working as electricians in North Carolina.

Tools and Textbooks

Electricians generally furnish their own tools, including screwdrivers, pliers, knives, brace and bits, and hacksaws, at a cost of about $35. Employers furnish heavier tools, such as pipe threaders, conduit benders, and most test meters and power tools.[7] Apprentices usually spend about $150 for books, an amount that is, in some cases, returned to them by their employers upon graduation.

Upward Mobility

On the strength of their electrical training, most apprentice electricians are able to pass the North Carolina Electrical Contractors' examination when they complete their training and thus become licensed contractors, able to contract to perform work costing $30,000 or more. Some seek employment in industry as maintenance electricians and work their way up to supervisory positions. However, many electricians choose to be self-employed.

Job Outlook

Employers forecast a shortage of electricians in an expanding economy. This shortage will be aggravated by it taking at least four years to train an apprentice to become an electrician. Moreover, employers cut back on apprenticeship training programs during the recent recession. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 12,900 electricians will be needed annually nationwide until 1990 to fill the job market needs for their services.[8]

"Once an electrician is qualified, he won't need to worry about work," says William D. Bridges, Jr., vice-president of operations, Graves Electric Company, Wilmington. "Even during a slump, good electricians still do not miss any time."[9]

For More Information

The National Joint Apprenticeship and Training Committee for the Electrical Industry
1200 18th Street, NW
Washington, D.C. 20036

International Brotherhood of Electrical Workers
1200 15th Street, NW
Washington, D.C. 20036

National Electrical Contractors' Association Carolinas Chapter
3705 Latrode Drive
Suite 340
Charlotte, North Carolina 28211 (704) 365-4016

North Carolina Association of Electrical Contractors
Suite 621
336 Fayetteville Street Mall
Raleigh, North Carolina 27601 (919) 821-1403

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[7] *Ibid.*; Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978); telephone interview with S. E. (Gene) Ruff, business manager, International Brotherhood of Electrical Workers, Local 379, Charlotte, 11 February 1983.

[8] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 48.

[9] Telephone interview with William D. Bridges, Jr., a Wilmington electrical contractor, 18 January 1983.

ENVIRONMENTAL CONTROL SYSTEMS INSTALLER/SERVICER
[HEATING, VENTILATION, AND AIR-CONDITIONING MECHANIC (HVAC)]

Job Description

Environmental control systems installers/servicers install, service, and repair environmental-control systems in residences, office buildings, and commercial establishments, utilizing knowledge of refrigeration theory, pipefitting, and structural layout. They mount compressors and condensers. Fabricate, assemble, and install ductwork and chassis parts. Install evaporators and other mechanical components of the system. Cut and bend tubing; cut and thread pipe; join tubing and pipes to refrigeration units by means of sleeves, couplings, or unions; and solder joints. Connect components to control panels, and control panels to power sources. Check pressure and vacuum gages. Test joints and connections for gas leaks. Using electrician's hand tools, they replace defective breaker controls, switches, and wiring.[1]

Environmental control systems installers/servicers, or heating, ventilation, and air-conditioning (HVAC) mechanics, are craftworkers in many trades: electricians, when working on HVAC power and control systems; pipefitters, when cutting, threading, and soldering pipes; and sheet metal workers, when cutting and bending galvanized steel into shape for ductwork.[2]

When installing environmental control systems, HVAC mechanics install the motors, compressors, condensing units, evaporators, piping, ductwork, and other components in place, following blueprints and design specifications. They connect the motorized units to an electrical power source, clean and lubricate machinery, add liquid refrigerant, adjust valves, and inspect other parts of the equipment to find leaks and other defects. When environmental control systems break down, they diagnose the cause and make repairs.[3]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as mathematics, mechanical drawing, electricity, physics, and blueprint reading is helpful.[4]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and 144 hours of related instruction for each 2000 hours of on-the-job training in such subjects as the use and care of tools, safety practices, blueprint reading, and heating and air-conditioning theory.[5]

Working Conditions

HVAC mechanics may have to work in cramped spaces under buildings, or in hot ceiling lofts, or on the tops of tall buildings. They are subject to being called upon to make service calls at odd hours and particularly in extremes of weather since breakdowns often occur then. When routine precautions are taken, the work environment is safe.[6]

Opportunities for Women

Intelligence and logical thinking rather than physical strength and stamina are favored in this occupation. Women who enjoy work that is intellectually demanding and who do not require traditional hours of work may thrive in a career as an environmental control systems installer/servicer.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 637.261-014, p. 554.

[2]Andrew D. Althouse, *et al*, *Modern Refrigeration and Air-Conditioning* (Homewood, Illinois: The Goodheart-Willcox Co., Inc., 1968), p. 27; interview with Wayne Shaw, estimator, Watco Corporation, Raleigh, 7 March 1983; telephone interview with Larry Gregory, business agent, Sheet Metal Workers Union, AFL-CIO, Local 159, Greensboro, 28 February 1983.

[3]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 331; Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahasse: Florida Department of Education, 1978).

[4]*Occupational Outlook Handbook*, p. 332, *supra* see note 3.

[5]*Ibid.*

[6]Telephone interview with Robert Royal, local coordinator, Carolinas Construction Training Council, Raleigh, 25 March 1983.

ENVIRONMENTAL CONTROL SYSTEMS INSTALLER/SERVICER
[HEATING, VENTILATION, AND AIR-CONDITIONING MECHANIC (HVAC)]
(Continued)

Tools and Equipment

The minimum set of hand tools for a journeyman includes valve and pipe wrenches, sockets, nut drivers, and hammers, and costs from $500 to $600.[7] Employers generally furnish such tools as vacuum pumps, test kits, and electronic leak detectors.[8]

Upward Mobility

Some HVAC mechanics advance to supervisory positions. Others who open their own contracting businesses must pass either the N.C. State Board of Examiners of Plumbing and Heating Contractors' licensing examination or the N.C. State Board of Refrigeration Examiners' licensing examination. A number of HVAC apprentices have become licensed HVAC contractors in North Carolina.

Job Outlook

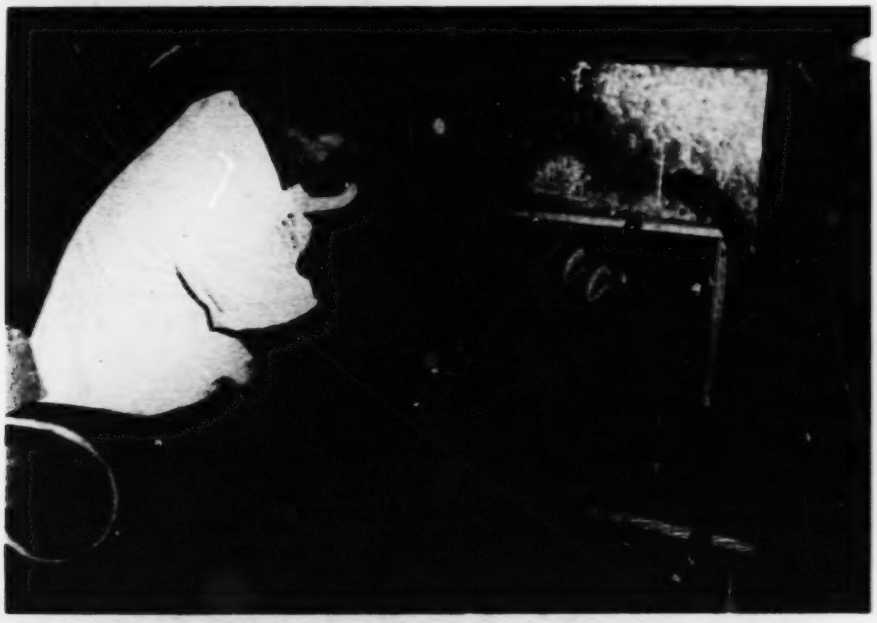
HVAC is a steadily growing field, and one not completely tied to prospects for the construction industry. Much of the work involves renovation of existing systems to conserve energy. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 8,200 environmental control systems installers/servicers will be needed annually nationwide until 1990 to fill the job market needs for their services.[9]

For More Information

Refrigeration Service Engineers Society
43 North Walker Avenue
Chicago, Illinois 60644

North Carolina Heating and Air-Conditioning Contractors' Association
Post Office Box 22534
Charlotte, North Carolina 28222 (704) 334-9954

North Carolina Association of Plumbing-Heating-Cooling Contractors
413 Glenwood Avenue
Raleigh, North Carolina 27603 (919) 833-0372



[7]Telephone interview with Alva Mallard, Mallard Mechanical Services, Inc., Raleigh, 25 March 1983.
[8]*Ibid.*
[9]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 62.

FIREFIGHTER

Job Description

Firefighters control and extinguish fires; select hose nozzles, depending upon the type of fire; and direct streams of water or chemicals onto the fire. They position and climb ladders to gain access to upper building levels; use axes, crowbars, electric saws, and other equipment to create openings in buildings for ventilation or entrance; and administer cardio-pulmonary resuscitation (CPR) and first aid to fire victims. Inspect buildings for fire hazards and compliance with fire prevention ordinances. Maintain equipment, including hydrants. Participate in drills, demonstrations, and courses in hydraulics, pump operation and maintenance, and firefighting techniques.[1]

The work of firefighters includes carrying emergency medical equipment to victims, climbing with heavy tools, rapidly conducting search and rescue activities, making difficult hose hookups, extricating trapped victims, controlling water pressure to keep the hose directed at the flames, running, climbing, carrying, and lifting. Most of the work is often done in 50 pounds of protective equipment and clothing such as boots, a helmet, and a turnout coat.[2]

"During duty hours, firefighters must be prepared to respond to a fire and handle any emergency that arises. Because firefighting is dangerous and complicated, it requires organization and teamwork. Firefighters may connect hose lines to hydrants, operate a pump, or position ladders. Because their duties may change several times while the company is in action, they must be skilled in many different firefighting activities, such as rescue, ventilation, and salvage. In addition, firefighters help people to safety and administer first aid."[3] Between alarms, they have practice drills and classroom instruction, and keep the equipment cleaned and maintained.[4]

"Most fire departments also are responsible for fire-prevention activities. They provide specially trained personnel to inspect public buildings for conditions that might cause a fire. They may check building plans, the number and working condition of fire escapes and fire doors, the storage of flammable materials, and other possible hazards. In addition, firefighters educate the public about fire prevention and safety measures."[5]

Entrance Requirements

Applicants must be high school graduates, be at least 19 years of age, be in top cardiovascular condition, and pass the General Aptitude Test Battery (GATB), which includes sections on numerical and verbal aptitude.[6]

Training Period

The apprenticeship program consists of 6000 to 8000 hours of on-the-job training under the supervision of experienced firefighters as well as 144 hours of related instruction for each 2000 hours of on-the-job training in such courses as firefighting techniques and equipment, chemical hazards associated with various combustible building materials, first aid, and fire prevention and safety.[7]

The firefighting apprenticeship begins with 14 weeks of intensive training that includes exercises in rope climbing and other physical skills; study of such subjects as hydraulics as it pertains to the properties of water under pressure in hoses, ventilation practices, and occupational safety and health standards on fire safety; and a three-week emergency medical technician (EMT) course in basic emergency life-saving skills like mouth-to-mouth resuscitation, cardio-pulmonary resuscitation (CPR), hemorrhage control, spinal immobilization, and patient assessment skills.[8]

Working Conditions

About 25 percent of firefighters' working time is spent in emergency situations. The remainder is spent on fire inspections, public instruction in fire prevention, fire drills, training, and equipment care.[9] Firefighters may be required to interrupt their private lives, at times, to spend up to 24 hours on call at the fire station.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 373.364-010, p. 254.

[2]Brad Keena, "What We're Learning About Firefighter Safety and Health," *Speaking of Fire*, Summer 1981.

[3]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 158.

[4]*Ibid.*

[5]*Ibid.*

[6]*Ibid.*

[7]*Ibid.*

[8]Interview with Frank Jones, training supervisor, City of Greensboro Fire Department, 8 March 1983; telephone interview with Thomas Harmelink, director, Office of Emergency Medical Services, North Carolina Department of Human Resources, 11 April 1983.

[9]Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

FIREFIGHTER (Continued)

Opportunities for Women

Women in good physical condition should have no difficulty in becoming successful firefighters. Many women nationwide have entered this field in the last few years and have shown that they can do the job well.

Tools and Textbooks

Fire departments in North Carolina generally furnish all books and equipment.

Upward Mobility

At the end of their first year, firefighters may take a qualifying examination for a position as an upper-level fireman.[10] Firefighters with experience and training may be gradually promoted to engineer, lieutenant, captain, battalion chief, assistant chief, and, ultimately, fire chief.[11]

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 7,500 firefighters will be needed annually nationwide until 1990 to fill the job market needs for their services.[12]

For More Information

International Association of Fire Fighters
1750 New York Avenue, NW
Washington, D.C. 20006

International Association of Fire Fighters, AFL-CIO
815 16th Street, NW
Washington, D.C. 20006

National Fire Protection Association
470 Atlantic Avenue
Boston, Massachusetts 02210

North Carolina State Fireman's Association
Post Office Box 188
Farmville, North Carolina 27828

[10]Telephone interview with Frank Jones, *supra* note 8.
[11]*Apprenticeship Deck*, *supra* note 9.
[12]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 40.

INSTRUMENT REPAIRER/MECHANIC

Job Description

Instrument repairers/mechanics install, repair, maintain, inspect, and adjust indicating, recording, telemetering, and controlling instruments used to measure and control variables, such as pressure, flow, temperature, motion, force, and chemical composition, using hand tools and precision instruments. They disassemble malfunctioning instruments, and examine and test mechanism and circuitry for defects. They also troubleshoot equipment in or out of control systems and replace or repair defective parts. For testing, they use such instruments as the potentiometer, resistance bridge, manometer, and pressure gage. Instrument repairers/mechanics inspect instruments periodically and make minor calibration adjustments to insure functioning within specified standards. They adjust and repair final control mechanisms, such as automatically controlled valves or positioners, and also calibrate instruments according to established standards.[1]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as mathematics, physical science, physics, electric and machine shops, and drafting is helpful.

Training Period

The training period varies from 8000 hours of traditional training, with related instruction at technical schools, to 4000 hours of performance-based training.[2] The traditional training period consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such courses as mathematics, physics, blueprint reading, and electronics.[3]

The performance-based training programs currently provide all related instruction within the plant through the use of videotapes, demonstrations by plant personnel, practice of skills in simulated work conditions, and other teaching methods. Proponents of performance-based training believe that this approach produces a more desirable mesh between theory and practice, and reduces the time needed for instruction.[4]

Working Conditions

Instrument repairers/mechanics sometimes must work around high voltage lines, machinery with moving parts, and steam and chemical pipes. They may also have to work in awkward positions and at great heights.[5] If proper safety procedures are followed, the possibility of an accident is significantly lessened.

Opportunitites for Women

The field of instrument repair/mechanics presents no barriers to women in terms of requirements for physical strength.[6] Any woman interested in this field should not be deterred from pursuing a successful career as an instrument repairer/mechanic.

Tools and Equipment

Apprentices may expect to spend about $600 on such equipment as meters, socket wrenches, soldering irons, and wirestrippers.[7] The larger, more expensive equipment is usually provided by the employer.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 710.281-026, p. 669.

[2]"Report on the Kelly-Springfield (Fayetteville) Apprenticeship Training Program" (Fayetteville: Kelly-Springfield Tire Company, November 1981); Barbara A. Kelley, "Performance-Based Training in Apprenticeship and an Overview of the Wisconsin Apprenticeship System" (Washington: Kirschner Associates, Inc., March 1981).

[3]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 36; Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahasse: Florida Department of Education, 1978).

[4]Kelly-Springfield and Wisconsin reports, *supra* see note 5.

[5]*Apprenticeship Deck, supra* see note 2.

[6]Interview with Stanley E. Zuravel, manager of craft training, Kelly-Springfield Tire Company, Fayetteville, 17 February 1983. Telephone interview, 18 April 1983.

[7]*Ibid.*

INSTRUMENT REPAIRER/MECHANIC (Continued)

Upward Mobility

A number of supervisory posts within the field are open to instrument repairers. They may also become service representatives, engineering assistants, superintendents of maintenance, or instrument engineers.

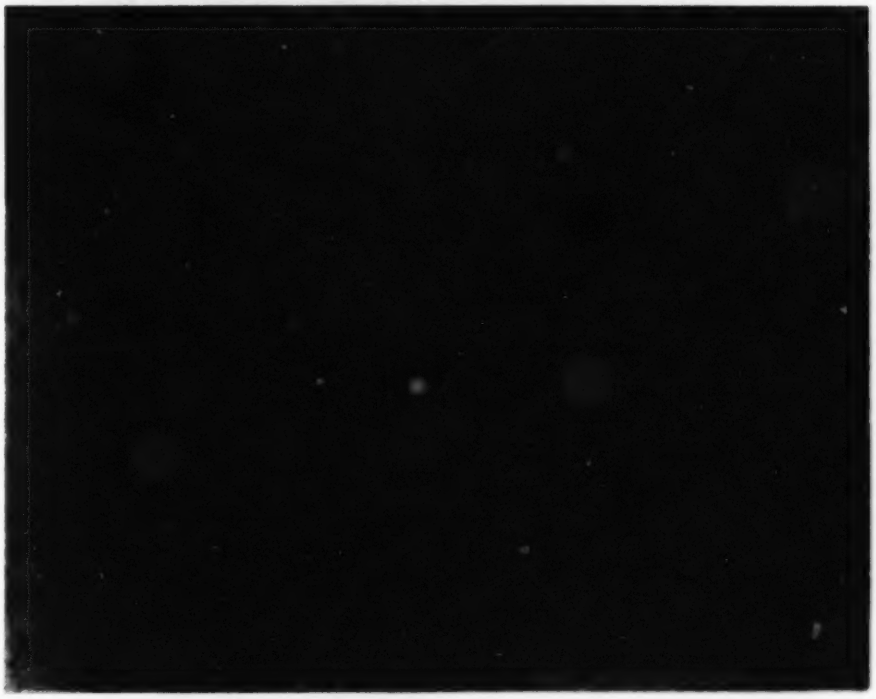
Job Outlook

Instrument repairers/mechanics face bright prospects. Their specialized skills will continue to be increasingly needed.[8]

For More Information

Instrument Society of America
530 William Penn Place
Pittsburg, Pennsylvania 15200

Instrument Society of America
Post Office Box 12277
67 Alexander Drive
Research Triangle Park, North Carolina 27709 (919) 549-8411



[8]*Occupational Outlook Handbook*, p. 36, *supra* see note 2.

INSULATION INSTALLER

Job Description

Insulation installers cover and line structures with asbestos, cork, canvas, tar paper, magnesia, and related materials, using saws, knives, rasps, trowels, and other tools and implements.[1] They insert insulating material in walls, floors, ceilings, and roofs of buildings.[2] Apply insulating material to exposed surfaces of equipment, such as boilers, tanks, air ducts, and pipes.[3]

Insulation installers minimize the wasteful transfer of heat and refrigeration to or from the space inside of homes, buildings, meat storage rooms, steam pipes, and boilers. Sometimes called applicators, they may paste, wire, tape, or spray insulation to an appropriate surface. When covering a steam pipe, for example, insulation installers may cut a tube of insulation to the necessary length, stretch it open along a cut which runs the length of the tube, and then slip it over the pipe.[4] "To secure the insulation, they wrap and fasten wire bands around it, tape it, or wrap a cover of tar paper, cloth, or canvas over it and then sew or staple the cover in place. Care is required to cover joints completely."[5]

When covering a wall or other flat surface, insulation is applied onto a wire mesh.[6] "The wire mesh provides a rough surface to which the foam can cling and adds strength to the finished wall."[7] In some places, such as attics, which do not require either wire mesh for adhesion or a final coat for appearance, insulation installers use a compressor to blow in the insulation. They fill the compressor with shredded fiberglass insulation. The air flow from the compressor forces the insulation through a hose, and controls the direction and flow of the insulation until the required amount is installed.[8]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as blueprint reading, shop math, and general construction is helpful.[9]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training. On the job, apprentices begin with instruction. They start with simple tasks, such as blowing in insulation and supplying insulation to experienced workers. In about six to eight months, assignments become more complex and within a year apprentices usually learn to measure, cut, fit, and install various types of insulation.[10]

Working Conditions

Insulation installers generally work indoors amidst the clutter of construction.[11] "They spend most of the workday on their feet, either standing, bending, stooping, or squatting. Sometimes they work from ladders or in tight spaces. However, the work is not strenuous; it requires more coordination than strength."[12] When removing old hazardous insulation material, such as asbestos, insulation installers follow strict safety procedures, such as the wearing of protective masks and clothing.

Opportunities for Women

Since this occupation stresses coordination over strength, interested women should have no difficulty in becoming successful insulation installers.

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[1] United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 863, p. 863.
[2] *Ibid.*, 863.134-010.
[3] *Ibid.*, 863.134-014.
[4] United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 225.
[5] *Ibid.*
[6] *Ibid.*
[7] *Ibid.*
[8] *Ibid.*
[9] *Ibid.*
[10] *Ibid.*
[11] *Ibid.*
[12] *Ibid.*

INSULATION INSTALLER (Continued)

Tools and Equipment

Insulation installers need tools that cost about $100 and include a knife, rule, T square, pointing trowel, flat trowel, and end nippers. A smaller assortment of tools, costing about $25, is enough for an apprentice to get started.

Upward Mobility

An insulation installer may advance to supervisor, shop superintendent, or insulation estimator, or may become an insulation contractor, which does not require a license in North Carolina.[13]

Job Outlook

With the rising interest in energy conservation, the insulation trade will continue to expand. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 2,600 insulation installers will be needed annually nationwide until 1990 to fill the job market needs for their services.[14]

For More Information

National Insulation Contractors Association
1120 19th Street, NW
Washington, D.C. 20035

Associated Builders and Contractors, Inc.
444 North Capitol Street, NW
Suite 409
Washington, D.C. 20001

[13] *Ibid.*; Florida Department of Education, Center for Career Development Services, *Apprenticeship Desk* (Tallahassee: Florida Department of Education, 1978); interview with Larry Bradley, president, Ambrose Insulation Company, Inc., Greensboro, 6 July 1983.

[14] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 48.

KNITTING MACHINE FIXER

Job Description

Knitting machine fixers set up, adjust, and repair knitting machines to knit hose, garments, and cloth according to specifications, using knowledge of machine functions. They insert cams, links, buttons, or needle jacks in pattern chains to set up machines to knit according to pattern design charts. Observe operation of machines and examine knitted material for defects. Turn setscrews and hand wheels to adjust machine parts, such as gears and cams, and to synchronize yarn carriers, needles, dividers, and sinkers. Repair and replace machine parts, using hand tools. Align and straighten needles, sinkers, and dividers, using pliers. May clean and oil machines.[1]

A fixer must be able to find a broken needle in what may seem like a haystack of needles — 402 of them to be exact, thickly clustered within a main cylinder just four inches in diameter in one knitting machine for stockings. If the problem is not a broken needle, the fixer must check the tiny cylinder fittings called selector fingers, the sinkers, or the 96 jacks in the pattern or selector drum to determine the cause of the problem.

Every needle has a minuscule latch which swings open and shut to form the eye of the needle, and any of these could break, turning on the red warning light that summons a fixer to investigate a malfunction. Every jack contains 26 nibs along its side, as fine as fishbones; these are sometimes broken off in forming a pattern for a stocking, and the fixer must find out which nib has been broken.

To begin the process of knitting, four selector fingers at different points on the cylinder of the machine pull yarn into the cylinder from bobbins suspended overhead. Four needles rise up to hook the yarn, latches close around it, and the needles pull it down to form stitches. Sinkers then remove the stitches from the hooks and hold them on the shanks of the needles, freeing them to move up to hook more yarn. The process continues around the cylinder at a speed of from 250 to 850 revolutions per minute.

As long as each needle takes the same amount of yarn and rises to the same height as every other needle, the machine will knit a plain stitch. To form a pattern, some needles must take more or less yarn than plain-stitch needles and must rise higher than they do. Patterning is the most difficult part of a knitting machine fixer's work. Fixers must be adept at spatial thinking to install patterns into machines, translating two-dimensional designs into sequential operations performed within a three-dimensional space of moving parts.

The process is complex enough to ensure that fixers of knitting machines never stop learning new skills, says Lambert Murray, knitting room supervisor at Ridgeview Mills in Newton. "It is something you never learn everything about," he says. "You learn something new every day."[2]

A typical apprentice training program for fixers runs for three years. Training includes courses in principles of knitting, properties of yarn, and basic mathematics.[3]

Entrance Requirements

Knitting machine fixers should be high school graduates, show an aptitude for mechanical work, and have the patience to spend eight hours a day troubleshooting machines.

Training Period

The apprenticeship program consists of 6000 hours of on-the-job training in conjunction with 144 hours of related instruction for each 2000 hours of on-the-job training.

Working Conditions

The sound of some 200 knitting machines in operation seems very loud to a visitor; knitting machine fixers, however, say that they get used to it. The work can be tedious and nerve racking when problems don't work out and highly satisfying when problems are solved. Fixers must be prepared to work night shifts in plants that run continuously.[4]

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 689.280-D14, p. 617.

[2]Interview with Lambert Murray, supervisor of knitting department, Ridgeview Mills, Newton, 14 June 1983.

[3]Telephone interview with Randy Bettington, Instructor, Catawba Valley Technical College, 20 June 1983.

[4]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 566.

KNITTING MACHINE FIXER (Continued)

Tools and Equipment

Knitting machine fixers buy their own screwdrivers, wrenches, and other hand tools; companies usually furnish drills and larger tools.

Opportunities for Women

Any woman interested in this field should not be deterred from pursuing a successful career as a knitting machine fixer.

Upward Mobility

Knitting machine fixers exercise supervisory functions in their positions as such, in working with knitters and teaching them how to use the machines. They are also in good positions to move into supervisory positions. Supervisors of knitting departments are apt to be knitting machine fixers.[5]

Job Outlook

Currently, apprenticeship opportunities for knitting machine fixers are not in as much demand as they have been in past years. The textile industry claims this is due in part to unfair foreign competition which has caused some mills to cut production and others to go out of business entirely. However, the potential for a well-paid, satisfying career as a knitting machine fixer still exists in many areas of North Carolina.

For More Information

American Textile Manufacturers Institute
Communications Division, Suite 300
1101 Connecticut Avenue, NW
Washington, D. C. 20036

United Textile Workers of America
420 Common Street
Lawrence, Mass. 01840

[5]Interview with Steve Crowe, Ridgeview Mills, Newton, 14 June 1983.

LAW ENFORCEMENT OFFICER

Job Description

Law enforcement officers maintain law and order and serve legal processes of courts. Patrols are assigned areas in which to enforce laws, investigate crimes, and arrest violators. Officers drive vehicles through assigned areas, observing traffic violations and issuing citations. Assume control at traffic accidents to maintain traffic flow, assist accident victims, and investigate causes of accidents. Investigate illegal or suspicious activities of people, quell disturbances, and arrest law violators. Locate and take people into custody on arrest warrants.[1]

The security of the nation's cities and towns greatly depends upon the work of law enforcement officers whose jobs range from controlling traffic to preventing and investigating crimes.[2] "Whether on or off duty, these officers are expected to exercise their authority whenever necessary."[3]

Law enforcement officers who work in small communities and rural areas have many duties.[4] "In the course of a day's work, they may direct traffic at the scene of a fire, investigate a housebreaking, and give first aid to an accident victim. In a large police department, by contrast, officers usually are assigned to a specific type of duty. Most officers are detailed either to patrol or to traffic duty. Fewer numbers are assigned to special work such as accident prevention or operation of communications systems. Others work as detectives (plainclothes officers) assigned to criminal investigation. Still others work as experts in chemical and microscopic analysis, firearms identification, and handwriting and fingerprint identification."[5]

While on patrol, law enforcement officers remain alert for anything.[6] "They note suspicious circumstances, such as open windows or lights in vacant buildings, as well as hazards to public safety, such as burned-out street lights or fallen trees. Officers also watch for stolen automobiles and enforce traffic regulations. At regular intervals they report to police headquarters through call boxes, by radio, or by walkie-talkie. They prepare reports about their activities and may be called upon to testify in court when cases result in legal action."[7]

Entrance Requirements

A high school diploma or equivalent is required and some post-secondary training in sociology, psychology, and criminal justice is encouraged. Applicants must be at least 20 years of age and must not have been convicted of any felony or offense of moral turpitude. Personal characteristics such as honesty, good judgement, and a sense of responsibility are also essential.[8]

Training Period

The apprenticeship program consists of 4000 hours of on-the-job training in conjunction with 290 hours of related instruction for each 2000 hours of on-the-job training.

Working Conditions

The scheduled workweek for law enforcement officers is usually 40 hours. However, they are subject to call at any time that their services are needed, and may work overtime in emergencies. They may be required to work outdoors for long periods in all kinds of weather.[9]

Opportunities for Women

Women are making up a larger share of police forces both in North Carolina and the nation as a whole. Women officers have repeatedly proven their fitness to serve as law enforcement officers. Some departments actively seek and recruit women interested in law enforcement. Women who are interested in law enforcement and who are in good physical condition should have no difficulty in succeeding in this profession.

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[1] United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 377.263-010, p. 259.
[2] United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p.161.
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*
[6] *Ibid.*
[7] *Ibid.*
[8] *Ibid.*, pp. 161-2.
[9] *Ibid.*, p. 161.

LAW ENFORCEMENT OFFICER (Continued)

Equipment and Textbooks

Most law enforcement departments issue apprentices everything but ties, socks, and shoes, and buy the test materials for use in related classroom instruction.

Upward Mobility

Law enforcement officers usually become eligible for promotion after a specified length of service.[10] "Promotions to the ranks of sergeant, lieutenant, and captain usually are made according to a candidate's position on a promotion list, as determined by scores on a written examination and on-the-job performance evaluations."[11] Some officers with years of experience and training retire from law enforcement agencies to work for a growing number of private security agencies that frequently offer positions of greater responsibility and commensurately higher pay.

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 16,500 law enforcement officers will be needed annually nationwide until 1990 to fill the job market needs for their services.[12]

For More Information

North Carolina Law Enforcement Officers' Association
Post Office Box 25428
Raleigh, North Carolina 27611 (919) 828-3861

North Carolina Police Executives' Association
Charlotte Police Department
Charlotte, North Carolina 28220 (704) 374-2337

North Carolina Association of Police Chiefs
Morganton, North Carolina (704) 437-2753

[10] *Ibid.*, p. 162.
[11] *Ibid.*
[12] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 40.

MACHINIST

Job Description

Machinists use machine tools to make or repair metal parts, tools, or machines, applying knowledge of mechanics, shop mathematics, metal properties, and machining operations. They study specifications to determine dimensions and tolerances of workpieces and sequences of needed operations. Verify alignment of workpieces and conformance to specifications throughout the course of machining with such instruments as micrometers, height gages, and gage blocks.[1]

They are skilled metal workers who can turn a block of metal into an intricate part, such as a gear or piston, that meets precise specifications. They can set up and operate most types of machine tools used to make metal parts for cars, machines, and other equipment, and also know the working properties of a variety of metals, such as steel, cast iron, aluminum, and brass, that are used to make these parts. Using their knowledge of metals and their skill with machine tools, machinists plan and carry out all the operations needed to make a machined product.[2]

"Before they actually begin work on a part, machinists usually consult blueprints or written specifications for the item. Using these, they select tools and materials for the job and plan the cutting and finishing operations."[3] They make standard shop computations relating to dimensions of work and machining computations. They must, for example, determine at what exact point on the workpiece they will bore the hole, how fast they can feed the metal workpiece into the machine, and what cooling oils they should use to keep the metal from overheating and ruining the job.[4]

To be sure that their work is accurate, machinists check it using precision instruments such as micrometers which measure to the thousandths and even millionths of an inch. When finished with machining operations, they may use hand files and scrapers to smooth rough metal edges before assembling the finished parts with wrenches and screwdrivers.[5]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as geometry, trigonometry, physics, and machine shop is helpful.[6]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2,000 hours of on-the-job training in such courses as blueprint reading, mechanical drawing, shop mathematics, and shop practices. On the job, apprentices begin by learning to chip, file, hand tap, dowel fit, rivet, and operate various machine tools.[7]

Working Conditions

"The work environment for machinists has improved considerably in recent years. Most machine shops are clean, well-lighted, and well-ventilated. . . . Noise levels also have been reduced with the introduction of better designed machine tools. In those shops where noise still is a problem, workers wear earmuffs or earplugs to protect their hearing."[8] They also wear safety glasses and steel-toed safety shoes where appropriate.

Opportunities for Women

Not many women currently work as apprentice machinists even though the field appears to offer good opportunites for women. Employers say that women are fully capable of doing the whole job. It may involve some heavy lifting, for instance, of vises and large workpieces, but most shops have hoists or cranes.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 600.280-022, p. 488. Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 34.

[3]*Ibid.*

[4]*Ibid.*

[5]*Ibid.*

[6]*Ibid.*, p. 35.

[7]*Ibid.*

[8]*Ibid.*, p. 34.

MACHINIST (Continued)

Tools and Equipment

The cost of a set of measuring instruments, including verniers, micrometers, and a dial indicator, is from about $300 to $700. Employers, however, routinely purchase these and reimburse themselves with deductions from apprentices' paychecks. Apprentices often may be able to make other tools that they need, such as parallels, V blocks, and angle plates, at technical schools or, at larger companies, on the job.

Upward Mobility

Apprentice machinists can advance to such positions as journeyman machinists and supervisors. With more training, they may become tool and die makers or instrument makers. Some open their own machine shops.[9]

Job Outlook

Because of the cutback in apprenticeship programs during the recent recession and the lengthy training period required for skilled machinists, the forecast is for a severe shortage of machinists during the next economic upswing.[10] According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 22,500 machinists will be needed annually nationwide until 1990 to fill the job market needs for their services.[11]

For More Information

International Association of Machinists
and Aerospace Workers
1300 Connecticut Avenue, NW
Washington, D.C. 20036

National Tool, Die and Precision Machining Association
9300 Livingston Road
Washington, D.C. 20022

National Machine Tool Builders Association
7901 Westpark Drive
McLean, Virginia 22102

The Tool and Die Institute
777 Basse Highway
Park Ridge, Illinois 60068

[9] *Apprenticeship Deck, supra* note 2.

[10] Merl W. Baker, *et al*, Louis Harris and Associates, Inc., *Attitudes Toward the Skilled Trades: Employment Issues in the Precision Metalworking Industry* (commissioned by Sentry Insurance on behalf of the Task Force on the Skilled Trades Shortage) (Louis Harris and Associates, Inc., November 1982), p. 32.

[11] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 23.

MAINTENANCE REPAIRER/MECHANIC

Job Description

Maintenance repairers/mechanics inspect pumps, pump power units, generators, and other mechanical equipment and machinery; and diagnose malfunctions, using motor analyzers, pressure gages, and factory manuals. Disassemble, overhaul, reassemble, and test equipment and machinery.[1]

"When a machine breaks down in a plant or factory, not only is the machine idle, but raw materials and human resources are wasted."[2] It is the maintenance repairer/mechanic's job to prevent these costly breakdowns and to make repairs as quickly as possible. Sometimes called industrial machinery repairers, they spend much of their time doing preventive maintenance, including keeping the machines well-oiled and greased, and periodically cleaning the parts. They also regularly inspect machinery and check performance. By keeping complete and up-to-date records, maintenance repairers/mechanics try to anticipate trouble and service machinery before the factory's production is interrupted.[3]

When repairs become necessary, the maintenance repairer/mechanic must first locate the specific cause of the problem, disassemble the equipment, and then repair or replace the necessary parts. When parts are not readily available or when a machine must be quickly returned to production, they must sketch a part that can be fabricated by the plant's machine shop. The maintenance repairers/mechanics reassemble and test each piece of equipment after it has been serviced, for once it is back in operation, the machine is expected to work as if it were new.[4]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such courses as mechanical drawing, mathematics, blueprint reading, and physics is helpful.[5]

Training Period

The apprenticeship program usually lasts 8000 hours and consists of on-the-job training and at least 144 hours of instruction for each 2000 hours of on-the-job training in such subjects as shop mathematics, blueprint reading, welding, and safety.[6]

Working Conditions

Maintenance repairers/mechanics may, at times, be required to work long hours of overtime to repair a malfunctioned machine that is essential to the factory's or plant's operation.[7] They may be expected to crawl into the cramped recesses of the machines in order to make the necessary repairs or may be required to climb about the ceiling girders in order to inspect the electrical wiring.[8]

Opportunities for Women

Women in good physical condition with good mechanical aptitudes can handle the work. Women interested in this occupation should not be deterred from becoming successful maintenance repairers/mechanics.

Tools and Equipment

Sponsors usually supply most of the tools used by maintenance repairers/mechanics, requiring apprentices only to purchase handwrenches, pliers, screwdrivers, and other basic tools.[9]

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 620.281-046, p. 538.
[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 347.
[3]*Ibid.*
[4]*Ibid.*
[5]*Ibid.*, p. 348.
[6]*Ibid.*
[7]Telephone interview with Merle V. McNutt, vice-president of operations, Wall Lenk Corporation, Kinston, 13 April 1983; Florida Department of Education, Center for Career Development Services, *Appprenticeship Deck* (Tallahasse: Florida Department of Education, 1978).
[8]Interview with James Schulist, manager of manufacturing engineering, Square D Company, Knightdale, 1 February 1983.
[9]Telephone interview with Merle V. McNutt, 25 May 1983.

MAINTENANCE REPAIRER/MECHANIC (Continued)

Upward Mobility

Maintenance repairers/mechanics are good candidates for promotion to middle- and upper-level supervisory positions.[10] Some are even promoted to the post of plant engineer.[11]

Job Outlook

North Carolina needs many more people trained as maintenance repairers/mechanics.[12] Far from posing a threat, the trend towards the use of robots offers a boom for some time to come for maintenance repairers/-mechanics with skills sophisticated enough to fix these machines.[13] According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 58,000 maintenance repairers/mechanics will be needed annually nationwide until 1990 to fill the job market needs for their services.[14]

For More Information

International Union of Electrical, Radio and Machine Workers
1126 16th Street, NW
Washington, D.C. 20036

International Union of United Automobile, Aerospace
and Agricultural Implement Workers of America
8000 East Jefferson Avenue
Detroit, Michigan 48214

[10] *Ibid.*
[11] *Apprenticeship Deck, supra* see note 7.
[12] McNutt interview, *supra* see note 9.
[13] *Ibid.*, Schulist interview, *supra* see note 8.
[14] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 64.

MILLWRIGHT

Job Description

Millwrights assemble, install, dismantle, and move machinery and equipment, using hoists, lift trucks, hand tools, and power tools. They weld, rivet, and otherwise fasten machines to foundations.[1]

In assembling machinery, they fit bearings, align gears and wheels, attach motors, and connect belts to prepare a machine for use. To mount and assemble a piece of equipment requires the use of such tools as wrenches, hammers, pliers, metal cutting torches, and other hand and power tools.[2]

Millwrights prepare for the installation of machinery by personally preparing or supervising the construction of concrete or steel foundations or wooden platforms on which pieces of heavy machinery are mounted. In order to do the job properly, they must know how to read blueprints and work with various building materials.[3]

In moving machinery, millwrights may use any number of rigging devices, such as hoists and small cranes. With the use of such equipment, the machinery can be properly positioned on the foundation. They may dismantle existing equipment when it becomes obsolete or when better use of factory space is needed. They may also perform preventive maintenance, such as oiling and greasing the machinery, and fixing or replacing worn parts.[4]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as science, mathematics, mechanical drawing, and machine shop is helpful.[5]

Training Period

The apprenticeship program usually consists of 8000 hours of on-the-job training and 144 hours of related instruction for each 2000 hours of on-the-job training in such courses as shop mathematics, blueprint reading, hydraulics, electricity, and safety.

Working Conditions

Millwrights may be required to climb about machinery, lift heavy objects, and work above ground at times, from ladders, catwalks, and scaffolding. Most job-related hazards are limited to minor strains, cuts, and bruises.[6]

Opportunities for Women

Women in good physical condition should have no difficulty performing the tasks necessary for this occupation. Interested women should not be deterred from becoming successful millwrights.

Tools and Equipment

Millwrights must furnish their own wrenches, hammers, pliers, and other hand tools. Most employers furnish power tools and cutting torches.

Upward Mobility

Millwrights can advance to numerous supervisory positions, such as plant supervisor.[7]

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 638.281-018, p. 556. Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahasse: Florida Department of Education, 1978).

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p.63.

[3]*Ibid.*

[4]*Ibid.*

[5]*Ibid*, p. 64.

[6]*Apprenticeship Deck, supra* note 2.

[7]*Ibid.*

MILLWRIGHT (Continued)

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 4,700 millwrights will be needed annually nationwide until 1990 to fill the job market needs for their services.[8]

For More Information

International Association of Machinists and Aerospace Workers
1300 Connecticut Avenue
Washington, D.C. 20036

Associated General Contractors of America
1957 E Street, NW
Washington, D.C. 20006

[8]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 27.

PIPEFITTER

Job Description

Pipefitters select type and size of pipe according to the job specifications. They plan sequence of installation to avoid obstructions and activities of other construction workers. Cut, thread (on threading machine), and bend pipe. Attach fittings and join piping with threaded, caulked, wiped, soldered, brazed, fused, or cemented joints. Secure pipes to structure with clamps, brackets, and hangers. Install and maintain refrigeration and air-conditioning systems, including compressors, pumps, meters, and pneumatic and hydraulic controls.[1]

Pipefitters install, repair, and maintain both high- and low-pressure pipes that carry hot water, steam, and other liquids and gases for use in industrial and commercial processes. They are responsible for installing the complex pipe systems in oil refinery, chemical processing, and nuclear power plants.[2] They also install, repair, and maintain the larger units, such as compressors, boilers, and air-conditioners, to which the pipes connect.[3]

Although some pipes come ready to install, pipefitters have to fit most pipes for the job by measuring, bending, cutting, and threading pipes and then bolting, blazing, solvent welding, screwing, or soldering them together. They install and connect pipes and fittings according to the instructions on blueprints. They may need to drill holes in ceilings, floors, and walls, or hang steel supports from ceilings to position the pipes properly.[4]

After setting the pipes in place, pipefitters connect them by inserting the end of a pipe into the slightly larger end of a valve or properly shaped connector. They then may use wrenches to screw threaded pipes tightly together, or may solvent weld or solder connections to prevent leaks. To connect large industrial pipes, they bolt together the raised collars on the ends of pipes and valves.[5]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as chemistry, general mathematics, mechanical drawing, physics, and shop is helpful.[6]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such subjects as drafting, blueprint reading, mathematics, and applied physics and chemistry. On the job, apprentices begin with simple tasks such as carrying materials and cleaning debris. They soon learn to measure and cut pipe, and later learn to bond, thread, and connect it.[7] "Welding, the most difficult form of connecting pipe, is taught toward the end of the training."[8] In the final phase of training, apprentices may learn to estimate costs.[9]

Working Conditions

Pipefitters frequently must stand for long periods and occasionally work in cramped or uncomfortable positions. They risk the danger of falls from ladders, cuts from sharp tools, and burns from hot pipes. Most injuries are not severe.[10]

Opportunities for Women

Very little about this occupation should deter any woman interested in pipefitting from becoming a successful pipefitter. In fact, a number of women are now working as pipefitters in North Carolina.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 862.381-018, p. 861.

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 233.

[3]Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

[4]*Occupational Outlook Handbook, supra* note 2.

[5]*Ibid.*

[6]*Ibid.*, p. 234.

[7]*Ibid.*

[8]*Ibid.*

[9]*Ibid.*

[10]*Ibid.*

PIPEFITTER (Continued)

Tools and Equipment

Pipefitters supply their own wrenches, reamers, drills, braces and bits, hammers, chisels, saws, and other hand tools. Most companies supply gas or acetylene torches, arc welders and other welding, soldering, and brazing equipment; as well as power machines to cut, bend, and thread pipes.[11]

Upward Mobility

Some pipefitters pursue supervisory positions as employees of licensed plumbing contractors. Other pipefitters take the State licensing examination in order to become licensed contractors themselves. Passing this examination requires supplemental knowledge of heat loss principles which are taught in technical school courses.

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 20,000 pipefitters and plumbers will be needed annually nationwide until 1990 to fill the job market needs for their services.[12]

For More Information

United Association of Journeymen and Apprentices of the Plumbing and Pipefitting
Industry of the United States and Canada
901 Massachusetts Avenue, NW
Washington, D.C. 20001

North Carolina Association of Plumbing-Heating-Cooling Contractors
413 Glenwood Avenue
Raleigh, North Carolina 27603 (919) 833-0372

[11] *Ibid.*, p. 233.

[12] United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 49.

PLUMBER

Job Description

Plumbers study blueprints to decide upon work aids and sequence of installations. They inspect structures to ascertain obstructions to be avoided. Locate and mark positions on walls and floors for pipes, pipe connections, and passage holes for pipes, using rules, spirit levels, and plumb bobs. Cut openings in walls and floors to accommodate pipe and pipe fitting, using hand and power tools. Cut and thread pipe, using pipe cutters, cutting torch and pipe-threading machine. Assemble and install valves, pipe fittings, and pipes. Fill pipe system with water or air and read pressure gages to determine whether system is leaking. Install and repair sinks, bathtubs, hot water heaters, and other plumbing fixtures.[1]

Plumbers install, repair, and maintain fresh water, gas, and waste disposal systems in homes, schools, factories, and other buildings. Both plumbers and pipefitters install pipes. They differ from each other chiefly in the kinds of pipe that they install. Pipefitters install pipes for hot water, steam, air, gas, and chemicals, sometimes in systems under much greater pressure than those of plumbing pipe.[2]

Although some pipes come ready to install, plumbers have to fit most pipes for the job by measuring, bending, cutting, and threading pipes and then bolting, blazing, solvent welding, screwing, or soldering them together.[3]

After setting the pipes in place, plumbers connect them by inserting the end of a pipe into the slightly larger end of a valve or properly shaped connector. They then may use wrenches to screw threaded pipes tightly together, or they may solvent weld or solder connections to prevent leaks.[4]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as chemistry, general mathematics, mechanical drawing, physics, and shop is helpful.[5]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such subjects as drafting, blueprint reading, mathematics, and applied physics and chemistry. On the job, apprentices begin with simple tasks such as carrying materials and cleaning debris. They soon learn to measure and cut pipe, and later learn to bend, thread, and connect it.[6] "Welding, the most difficult form of connecting pipe, is taught toward the end of training."[7] In the final phase of training, apprentices may learn to estimate costs.[8]

Working Conditions

Plumbers frequently must stand for long periods and occasionally work in cramped or uncomfortable positions. They risk the danger of falls from ladders, cuts from sharp tools, and burns from hot pipes. Most injuries are not severe.[9]

Opportunitites for Women

Very little about this occupation should deter any woman interested in plumbing from becoming a successful plumber.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 862.381-030, p. 861.

[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 233.

[3]*Ibid.*

[4]*Ibid.*, p. 234.

[5]*Ibid.*

[6]*Ibid.*

[7]*Ibid.*

[8]*Ibid.*

[9]*Ibid.*

PLUMBER (Continued)

Tools and Equipment

Plumbers need only their measuring instruments: a rule, a pocket level, and a plumb bob. Most companies furnish all tools needed in the trade, which include pipe wrenches, blow torches, soldering irons, and welding gear.

Upward Mobility

Some plumbers pursue supervisory positions as employees of licensed plumbing contractors. Other plumbers take the State licensing examination in order to become licensed contractors themselves.

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 20,000 plumbers and pipefitters will be needed annually nationwide until 1990 to fill the job market needs for their services.[10]

For More Information

National Association of Journeymen
and Apprentices of the Plumbing
and Pipefitting Industry of the
United States and Canada
901 Massachusetts Avenue, NW
Washington, D.C. 20001

National Association of Plumbing-Cooling-
Heating Contractors
1016 20th Street, NW
Washington, D.C. 20036

North Carolina Association of Plumbing-
Heating-Cooling Contractors
413 Glenwood Avenue
Raleigh, North Carolina 27603 (919) 833-0372

[10]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 49.

PSYCHIATRIC AIDE

Job Description

Psychiatric aides perform a variety of duties to care for the patients in mental institutions. They help patients become accustomed to hospital routine. They encourage them to participate in social and recreational activities; feed them or attempt to persuade them to eat; accompany them to and from wards for examinations and treatments; assist them in bathing, dressing, and grooming; observe them to detect unusual behavior; and aid or restrain them to prevent injury to themselves or other patients.[1]

Another of their major functions is to communicate and interact with patients. They should have a sense of self-awareness in order to come across to the patient in the best way and communicate most effectively with the patient. Every contact between a patient and a psychiatric aide should be one in which the patient sees an appropriate model for behavior or reaction to certain situations and certain stimuli.[2]

After being trained in overviews of psychosocial development and specific psychiatric conditions, psychiatric aides practice "attitude therapy approaches" on patients with a given problem or a given set of problems. In the case of a depressed patient, for instance, psychiatric aides try to encourage the patient to engage in a variety of activities and to remain active, rather than to allow the patient to withdraw by going to bed and remaining disengaged from social interaction.[3]

Psychologists structure these therapeutic approaches, but psychiatric aides must possess excellent judgement skills in deciding which therapeutic approach is appropriate at the time. For instance, it may be appropriate for the psychiatric aide to use an attitude therapy of "active friendliness" towards a patient who is in a delusional state but who is not overly suspicious or paranoid. In using "active friendliness," psychiatric aides initiate interaction with the patient, by engaging the patient in conversation and encouraging the patient to take part in certain activities. Psychiatric aides must judge when "active friendliness" therapy is not appropriate, such as the case when the patient may become very suspicious and even engage in aggressive behavior. At that point, the aide would begin to use an attitude therapy called "passive friendliness," which is designed to let the patient know that the staff is there to help but is not going to approach the patient. Psychiatric aides must have a clinical sense about them to detect the need for such changes in therapy.[4]

Along with serving as therapeutic agents, psychiatric aides observe patients and take notes on their behavior for the use of hospital psychiatrists and psychologists.[5] Other duties include serving meals, feeding patients who are unable to feed themselves, making beds, and bathing and dressing patients. They also may give massages, take temperatures, and assist patients in getting out of bed and walking.[6]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as home nursing and first aid is helpful. Applicants must be at least 18 years of age, emotionally stable, and have a genuine desire to help people.[7]

Training Period

The apprenticeship program consists of 2000 hours of on-the-job training and 160 hours of related instruction.[8] On the job, apprentices begin their training by learning to take and record temperatures, bathe patients, change linens on beds occupied by patients, and move and lift patients.[9] Apprentices receive related instruction in first aid skills, cardio-pulmonary resuscitation (CPR), physical intervention techniques for blood pressure readings, giving bed baths, and moving non-ambulatory patients.[10]

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 355.377-014, p. 241.
[2]Telephone interview with Alexander A. Manning, Ph.D., director of psychology, Broughton Hospital, Morganton, 8 June 1983.
[3]*Ibid.*
[4]*Ibid.*
[5]*Ibid.*
[6]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 399.
[7]*Ibid.*
[8]Interview with Shirley McNeely, director of nursing education, Broughton Hospital, Morganton, 25 April 1983.
[9]*Occupational Outlook Handbook, supra* note 6.
[10]Interview with Shirley McNeely, *supra* note 8.

PSYCHIATRIC AIDE (Continued)

Working Conditions

The scheduled workweek of psychiatric aides is usually 40 hours.[11] "Because patients need care 24 hours a day, scheduled work hours include nights, weekends, and holidays. Workers spend many hours standing and may have to move patients in bed or help them stand or walk."[12]

Opportunities for Men

Although this field has traditionally been dominated by women, men interested in working with and helping the mentally ill and handicapped should not be deterred by any occupational-sexual stereotyping. Many men have become successful psychiatric aides and have found their work very rewarding.

Tools and Equipment

Psychiatric aides may have to buy their own uniforms and some medical instruments, such as a stethoscope.

Upward Mobility

In their work, some psychiatric aides have found the motivation to go on to study for positions as either registered or licensed practical nurses.

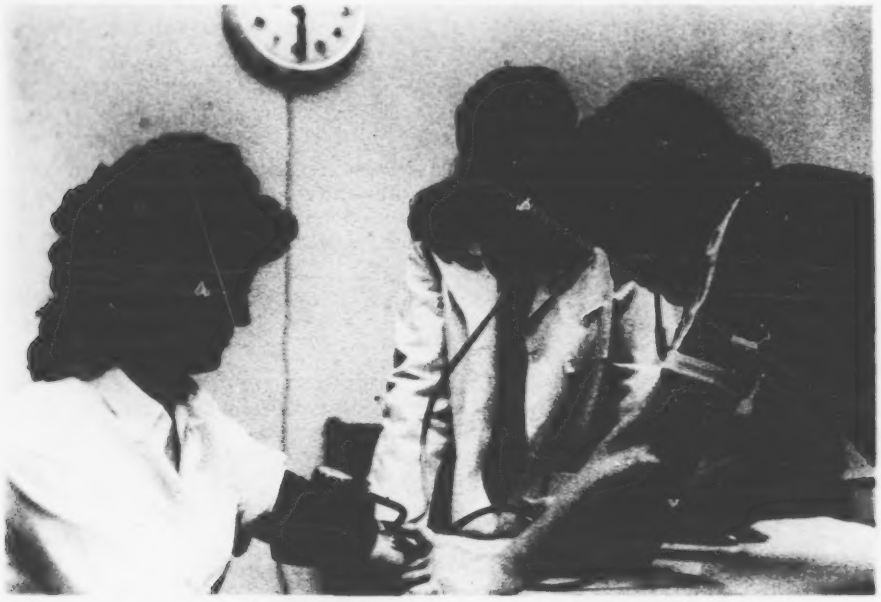
Job Outlook

Psychiatric aides are presently trained only in State mental hospitals. Apprentices are selected and trained on the basis of need at the individual hospital. Turnover in aide positions is moderate with an average of between 25 and 40 apprentices in training, statewide.

For More Information

Southern Psychiatric Association
Post Office Box 10387
Raleigh, North Carolina 27605 (919) 821-2226

North Carolina League for Nursing
Post Office Box 10683
Raleigh, North Carolina 27605 (919) 833-9449



[11] *Occupational Outlook Handbook, supra* note 6.
[12] *Ibid.*

ROTOGRAVURE-PRESS OPERATOR

(See Page 10 for Photograph)

Job Description

Rotogravure-press operators perform make-ready tasks to prepare the press for production runs. They select and install the proper engraved printing cylinders and paper. Determine ink color and consistency desired. Install and adjust the "doctor" blade, which wipes excess ink from the printing cylinder. Thread the web of paper or other printing stock through the press adjusting guides and tension bars. Set electronic controls, and drying chamber temperature. Choose the delivery system set-up at the discharge end of the press for cutting and/or creasing and stacking the printed stock while also removing cut-away waste stock. Monitor copy quality and press operation during production runs by visual inspection and electronic monitoring devices. Make adjustments as necessary. After a run, wash up, clean, and oil press. Make minor press repairs and assist repairmen on major jobs.

"Gravure" or "intaglio" (in-tal-yo) describes one of the four chief methods of printing.[1] This method transfers an image to paper using a copper coated cylinder or plate into which an image has been etched. "During the printing process, the printing cylinder rotates in an ink-filled trough. The ink covers the cylinder and fills the etched areas. The unetched surface of the cylinder is wiped clean by a thin steel scraper called a *doctor blade*, leaving ink only in the etched areas below the cylinder surface. This ink is then transferred directly to the paper, [by the suction of the paper against the surface] and the image is reproduced."[2]

The advantage of the gravure printing method is that it reproduces uniformly high quality photographs and illustrations over very long production runs.[3] Some familiar examples of material produced by rotogravure are Sunday newspaper supplements, magazines, mail order catalogues, cigarette cartons, printed plastic packaging, and vinyl flooring.[4]

Working Conditions

Press operators must stand for long periods in a noisy environment. Many are required to wear ear protectors. Fumes from ink solvent, which may be toxic, flammable, or explosive, will be present. Press operators are subject to hazards when working near machinery. Deadline pressure to complete printing jobs may be a significant work factor. Many press operators work evening and night shifts. Work areas are generally very clean and safety is stressed as a "way of life."[5]

Opportunities for Women

Women with aptitude and interest in the trade and who are in good physical condition should have no difficulty in successfully completing apprenticeship training and becoming a qualified press operator.

Tools, Equipment, and Materials

The apprentices must purchase their own set of small hand tools, including a wrench set, hammer, pliers, and screwdrivers.

Upward Mobility

From journeyman operators, people with managerial skills may become press-operators-in-charge (crew foremen), or plant supervisors, superintendents, or managers. The applicants must be aware that many employers will want to hire them as "helpers" (cleanup people, carton-catchers, etc.) before accepting them as apprentices. This can be a useful period in which the employer assesses the applicant's skill potential, attitude, and congeniality with the group. The employee should also use this period to assess the employer's demands, policies, and congeniality.

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[1]Strauss, Victor, *The Printing Industry: An introduction to its many branches, process and products.* (Arlington, VA.: Printing Industries of America, Inc., 1967), p.1. (Hereafter cited as *Printing Industry)*

[2]Meredith/Burda, Inc., promotional brochure.

[3]Melcher, Daniel, and Larrick, Nancy, *Printing and Promotion Handbook: how to plan, produce, and use printing, advertising and direct mail.* (New York, McGraw-Hill, 1956), p. 120.

[4]Allen, Edward M., ed. and comp., *Harper's Dictionary of the Graphic Arts.* (New York, Harper and Row), p. 239.

[5]United States Department of Labor, Employment and Training Administration, *Selected Characteristics of Occupations Defined in the Dictionary of Occupational Titles.* (Washington, D.C., GPO 1981), p. 63.

ROTOGRAVURE-PRESS OPERATOR (Continued)

Job Outlook

The job outlook in the rotogravure industry appears to be good, even though web-offset presses are the "wave of the future."[9] North Carolina has recently seen a slowing of employment expansion in this field, but people who are located near (or are willing to move near) large rotogravure plants and who can succeed in gaining employment as an apprentice may reasonably expect a secure and rewarding career.

In a large plant which performs every aspect of preparation for printing in addition to the actual press operation, the following areas may be available as separate apprenticeship jobs:

1. Photo reproduction. Electronically separates customer photos into four film positives — one for each of the four basic printing colors (yellow, red, blue, and black). Checks film for correct density, which determines how light or dark the color will appear when printed.

2. Photo retoucher. Corrects film density by carefully applying dye to the separation positives.

3. Stripper. Assembles and aligns film positives, and sizes and trims them to final reproduction page size. The assembled films are then positioned according to cylinder layout and carbon tissue is placed over the film and exposed. Carbon tissue is photosensitive material used in etching the printing clinder. The exact position of the carbon tissue affects whether the cylinder will register or align the image correctly on the paper stock.

4. Cylinder plater. Calibrates Polish Master machine to assure perfectly round and balanced printing cylinders, which are essential to assure proper color registration (alignment or printed image on paper) and quality of the finished product.

5. Etcher. Carefully sets machine controlling ferric chloride etching solution to etch the printing cylinder to the proper depth. Digital computer-controlled etching systems have been recently introduced, so an etcher may function as a computer programmer/operator.

6. Re-etcher. Corrects an etched cylinder by hand, using engraving tools and a magnifying glass. Cells etched in the cylinder are only a few thousandths of a millimeter deep, so the task demands great skill and patience.

7. Binder. Finished printed copies arrive in the bindery area as groups of pages called signatures. Several signatures are assembled by machine and bound to form completed magazines or catalogues. Customers' mailing labels may also be affixed in this process.

Entrance Requirements

A high school diploma or equivalent is recommended. The candidate must be at least 18 years old, and may have to pass an aptitude test and physical examination. Instruction in such high school courses as English, math, chemistry, and physics is helpful. Vocational training school or college courses in graphic arts, printing processes, and principles of light and color are a plus.

Manual dexterity, good eyesight, the ability to distinguish and match colors exactly, mechanical aptitude and ability to operate electronic controls are necessary attributes of a good applicant for most printing positions.

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training, and at least 144 hours of related instruction for each 2000 hours of on-the-job training. On-the-job training includes instruction in press safety, properties of ink and its components, and terminology and qualities of various printing paper stocks. It also includes instruction in the care, maintenance, operation, and adjustment of each major component of the press.

For More Information

Graphic Arts Technical Foundation
4615 Forbes Avenue
Pittsburgh, PA 15213

Printing Industries of America, Inc.
1730 N. Lynn Street
Arlington, VA 22209

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[9]United States Department of Labor, Bureau of Labor Statistics, Bulletin 2200, *Occupational Outlook Handbook*, 1982-3 ed., (Washington, D.C., GPO) p. 431.

SHEET METAL WORKER

Job Description

Sheet metal workers select gage and type of sheet metal for parts, drawing upon knowledge of metal. They locate and mark dimensions and reference lines on sheet metal, using scribes and dividers. Operate shears, brakes, and other fabricating machines to cut, bend, and straighten sheet metal. Shape metal with hammer over anvils, blocks, or forms. Join sheet metal parts together with soldering and welding. Smooth seams, joints, or burred surfaces with files or grinders. Install assemblies according to blueprint specifications. Measure assemblies for conformance to specifications with calipers, scales, and micrometers.[1]

Sheet metal workers construct and install sheet-metal ducts for air conditioning, heating, and ventilating systems — flat metal for kitchen walls and counters, and stamped metal for roofing and siding.[2] "They also install roof gutters and downspouts for rainwater drainage and make skylights and vents for industrial buildings."[3] Working from blueprint specifications, they construct much of the metal at the shop by measuring, cutting, bending, shaping, and fastening most of the pieces that will be used on the job. They then bolt, cement, rivet, solder, or weld the seams and joints together to form ducts, pipes, tubes, and other items.[4]

Sheet metal workers install ducts, pipes, and tubes by joining them end to end and hanging them with metal hangers secured to a ceiling or a wall. To hold the pieces together, they may bolt, weld, glue, or solder or use specially formed sheet metal for connections. They usually measure and cut molded and pressed sheet metals on the job. After securing the first panel in place, they interlock and fasten the grooved edge of the next panel into the grooved edge of the first panel and then nail the free edge of the second panel to the structure; this two-step process is repeated for each additional panel. Finally, at joints along corners, and around windows and doors, they fasten machine-made molding to the panels for a neat, finished effect.[5]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as mathematics, mechanical drawing, and shop is helpful.[6]

Training Period

The apprenticeship program usually consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such subjects as drafting, blueprint reading, applied mathematics, welding, and the principles of heating, air conditioning, and ventilating systems.[7] Apprentices attend school on their own time with no pay. On-the-job training consists of learning to use the tools, machines, equipment, and materials of the trade.[8] "In the first two years, they learn to measure, cut, bend, fabricate, and install sheet metal. They begin with duct work and gradually advance to fabricating decorative pieces. Towards the end of their training, they learn to use materials such as plastics and acoustical tile, which may be substituted for metal on some jobs."[9]

Working Conditions

When installing gutters and skylights, sheet metal workers work high above the ground. They are also required to do a considerable amount of bending, lifting, standing, and squatting in close quarters or in awkward positions. They risk some cuts and burns from materials and tools.[10]

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[1] United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 804.281-010, p. 808.
[2] United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 236.
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*
[6] *Ibid.*
[7] *Ibid.*, pp. 236-7.
[8] *Ibid.*
[9] *Ibid.*, p. 237.
[10] *Ibid.*, p. 236.

SHEET METAL WORKER (Continued)

Opportunities for Women

Presently, there are few women working as sheet metal workers. Women with aptitude and interest in the trade and who are in good physical condition can be expected to successfully complete apprentice training and become qualified sheet metal workers.

Tools and Textbooks

Sheet metal workers furnish their own hand tools which include hammers, pliers, "aviation" (curved right and left hand snips), "bulldogs" (straight-line snips), rivet sets and hand rivet guns, dividers, punches, scribes, hacksaws, fold-out rulers or steel rules, and Whitney punches. Total cost is about $400–$600. Employers usually provide textbooks and electrical tools such as drill molders and pop rivet guns.

Upward Mobility

Sheet metal work may open the way to jobs in drafting or estimating. It may also lead to work as sheet metal contractors for those sheet metal workers who pass the State licensing examination given by the N.C. State Board of Plumbing and Heating Contractors.

Job Outlook

According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 3,500 sheet metal workers will be needed annually nationwide until 1990 to fill the job market needs for their services.[11]

For More Information

Sheet Metal Workers International Association
1000 Connecticut Avenue, NW
Washington, D.C. 20036

Sheet Metal and Air-Conditioning Contractors
National Association Inc.
107 Center Street
Elgin, Illinois 60120

Sheet Metal Industry Promotion Plan
909 The East Ohio Building
Cleveland, Ohio 44114

Carolinas Roofing and Sheet Metal
Contractors Association, Inc.
Post Office Box 10862
Raleigh, North Carolina 27605 (919) 821-0214

[11]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 50.

STRUCTURAL STEEL WORKER

Job Description

Structural steel workers, following blueprint specifications, raise, place, and unite girders, columns, and other structural-steel members to form completed structures or structure frameworks. They set up hoisting equipment for raising and placing structural-steel members. Fasten steel members to cable of hoist, using chains, cables, or ropes. They signal workers operating hoisting equipment to lift and place steel members. Guide members using tab lines (rope) in order to guide them into position. Pull, push, or pry steel members into approximate positions while the members are supported by hoisting devices. Force members into final positions, using turnbuckles, crowbars, jacks, and hand tools. To align correctly and permanently connect a steel member, they use plumb bobs, levels, and measuring tapes. After removing any temporary bolts and jockeying the steel beam or girder into position with winches, hoists, and jacks, they then bolt, rivet, or weld the correctly aligned member to others for final fastening.[1]

Structural steel workers erect, align, and fasten steel framework and other metal parts in buildings, bridges, and other structures such as storage tanks. They also rig (prepare for moving) such heavy construction machinery as cranes and derricks and deliver the machinery to new sites. In addition, they make alterations, such as installing steel stairs, adding window guards to buildings, set steel rods or bars in concrete forms to reinforce the concrete; install catwalks, floor gratings, ladders, metal cabinets, window frames, lamp posts, fences and decorative ironwork, and do repair work, such as replacing metal bridge parts.[2]

In constructing a large building, steel workers generally specialize in a particular operation such as welding or riveting.

Entrance Requirements

A high school diploma or equivalent is recommended. Applicants must be at least 18 years of age and in good physical condition. Instruction in such high school courses as general mathematics, mechanical drawing, and shop provides a helpful background.[3]

Training Period

The apprenticeship program usually consists of 6000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such subjects as drafting, blueprint reading, and mathematics applicable to layout work. On the job, apprentices learn ornamental assembling, reinforcing rigging, structural erecting, welding and the care and use of tools, equipment, and materials commonly used in the trade.[4]

Working Conditions

Structural steel workers usually work outside, and at times, at great heights and in uncomfortable positions. Although they risk injury from falls, accidents have been reduced considerably through the use of safety devices such as nets, safety belts, and scaffolding.[5]

Opportunities for Women

The traditional stereotype that structural steel work is a man's job is false. Despite widespread belief that one must be a "heavyweight," agility is more important than brawn in many aspects of the work.[6] Women in good physical condition who have an interest and the aptitude for the trade should have no problem becoming successful structural steel workers.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 801.361-014, p. 806. *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 226; Florida Department of Education, Center for Career Development Services, *Apprenticeship Deck* (Tallahassee: Florida Department of Education, 1978).

[2]Oregon Building Congress, Apprenticeship Brochure Committee, *Opportunities For You* (Oregon Building Congress, 1969), p. 10; United States Department of Labor, Bureau of Labor Statistics, *supra* p. 226.

[3]*Occupational Outlook Handbook*, p. 227.

[4]*Ibid.*, p. 226.

[5]*Ibid.*

[6]Interview with Micheal Fields, ironworker, Daniels Construction Company, Shearon Harris Nuclear Power Plant, 27 June 1983.

STRUCTURAL STEEL WORKER (Continued)

Tools and Equipment

Structural steel workers wear tool belts containing spud wrenches, drift pins, beaters (four-pound hammers), bolt bags, burning or safety goggles (for use with acetylene torches), soapstone, and a tape measure. Total cost ranges from $75 to $150.[7]

Upward Mobility

Structural steel workers with experience and training may become crew leaders or supervisors. A number of structural steel workers have taken the state licensing examination and become general contractors, able to accept contracts for major building projects.[8]

Job Outlook

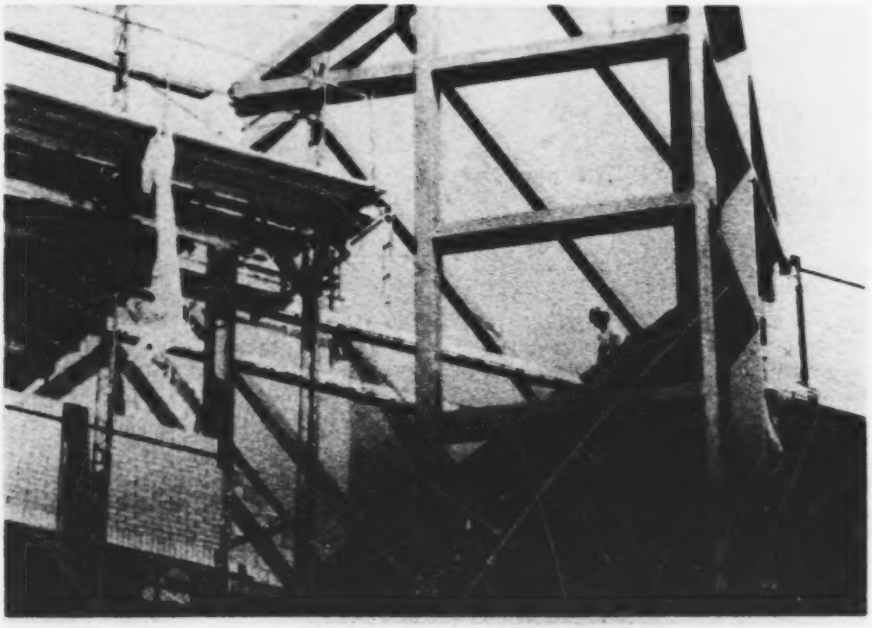
As with other construction occupations, there is a continuing need for structural steel workers. The availability of qualified workers is very low at the present time and for the foreseeable future.

For More Information

International Association of Bridge, Structural and Ornamental Ironworkers
36150 Live Street
St. Louis, Missouri

Associated General Contractors of America, Inc.
1957 E Street, NW
Washington, D.C. 20006

American Institute of Steel Construction, Inc.
Post Office Box 36186
1409 East Boulevard Street
Charlotte, North Carolina 28236 (704) 375-6547



[7] *Ibid.*
[8] *Apprenticeship Deck, supra* note 2.

TOOL AND DIE MAKER

Job Description

Tool and die makers, after studying specifications, design tools and dies, and operate machine tools to make and repair metalworking dies, molds, cutting tools, jigs and fixtures (devices that hold metal while it is shaped, stamped, or drilled), gages, and machinists' hand tools. Diemakers construct metal forms (dies) to shape metal in stamping and forging operations. They machine metal molds for dies used for metal diecasting, and machine metal for plastic injection or compression molds.[1]

"Tool and die makers are highly skilled, creative workers whose products —tools, dies, and special guiding and holding devices — are used by other machining workers to mass-produce precision metal parts.

"Compared with most other machining workers, tool and die makers have a broader knowledge of machining operations, mathematics, and blueprint reading. Like machinists, tool and die makers use almost every type of machine tool and precision-measuring instrument. Because they work with all the metals and alloys commonly used in manufacturing, tool and die makers must be familiar with the machining properties, such as heat tolerances, of a wide variety of metals and alloys."[2]

Entrance Requirements

A high school diploma or equivalent is recommended. Instruction in such high school courses as algebra, geometry, trigonometry, physics, and machine shop is helpful.[3]

Training Period

The apprenticeship program consists of 8000 hours of on-the-job training and at least 144 hours of related instruction for each 2000 hours of on-the-job training in such courses as shop mathematics, shop theory, mechanical drawing, tool designing, and blueprint reading. On the job, apprentices learn to operate the drill press, milling machine, lathe, grinder, and other machine tools; and learn to use hand tools in fitting and assembling tools, gages, and other mechanical equipment. They also study heat treating and other metalworking processes.[4]

Working Conditions

The work environment for tool and die makers has improved considerably in recent years. Most tool and die shops are clean, well-lighted, and well-ventilated.[5] "Noise levels also have been reduced with the introduction of better designed machine tools. In those shops where noise is still a problem, workers wear earmuffs or earplugs to protect their hearing."[6] They also wear safety glasses and steel-toed safety shoes where appropriate.

Opportunities for Women

Currently not many women work as tool and die maker apprentices, even though the field offers good opportunities for women. Employers say that women are fully capable of doing the whole job. Any woman interested in this profession should do well.

Tools and Equipment

Tool and die makers furnish many of their own hand tools, such as three or more sets of micrometers, vernier calipers, a pair of V-blocks, protractors, scales, steel rulers, allen wrenches, open and box end wrenches, dial indicators, surface gages, parallels, scribes, punches, and depth gages. Employers provide the machine tools, such as milling machines, lathes, and grinders that are routinely used by tool and die makers; and make available many of the hand tools. It is not uncommon for tool and die makers to accumulate over $10,000 worth of tools each during their careers.

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[1]United States Department of Labor, Employment and Training Administration, *Dictionary of Occupational Titles*, Fourth Edition (United States Department of Labor, 1977), 601.280-046, p. 491.
[2]United States Department of Labor, Bureau of Labor Statistics, *Occupational Outlook Handbook, 1980-81 Edition* (United States Department of Labor, March 1980), Bulletin 2075, p. 40.
[3]*Ibid.*
[4]*Ibid.*
[5]*Ibid.*, p. 34.
[6]*Ibid.*

TOOL AND DIE MAKER (Continued)

Upward Mobility

"Tool and die makers with strong training in mathematics, hydraulics, electricity, and basic sciences have a good chance for advancement. Some are advanced to supervisory and administrative posts."[7] Many become estimators and designers. Some even open their own tool and die shops.[8]

Job Outlook

North Carolina currently has a shortage of tool and die makers. According to the U.S. Department of Labor's Bureau of Labor Statistics, at least 8,600 tool and die makers will be needed annually nationwide until 1990 to fill the job market needs for their services.[9]

For More Information

International Association of Machinists and Aerospace Workers
1300 Connecticut Avenue, NW
Washington, D.C. 20036

National Tooling and Machining Association
9300 Livingston Road
Washington, D.C. 20022

National Machine Tool Builders Association
7901 Westpark Drive
McLean, Virginia 22102

The Tool and Die Institute
777 Basse Highway
Park Ridge, Illinois 60068

[7]Florida Department of Education, Center for Career Development Services, *Appenticeship Deck* (Tallahasse: Florida Department of Education, 1978).
[8]*Ibid.*
[9]United States Department of Labor, Bureau of Labor Statistics, *Occupational Projections and Training Data, 1980 Edition* (United States Department of Labor, September 1980), Bulletin 2052, p. 24.

AUTOMOBILE MECHANIC
(See Occupational Description on Page 13)

PART THREE
Appendices

APPENDIX A

Journeyman Wages for Newly Completed Apprentices*

Trade	Maximum Hourly Rate	Minimum Hourly Rate	Average
Asbestos Worker	$ 8.05	$ 8.05	$ 8.05
Auto Body Repairer	8.00	6.25	7.15
Auto Mechanic	18.10	6.00	8.52
Automatic Screw-Machine Set-up Operator	6.00	6.00	6.00
Baker	7.50	7.50	7.50
Biomedical Equipment Technician	9.15	7.50	8.42
Boat Builder, Fiberglass	8.50	8.50	8.50
Boilermaker	12.00	12.00	12.00
Book Binder Machine Operator	12.86	12.86	12.86
Bricklayer	13.86	6.50	8.73
Cabinetmaker	8.50	6.50	7.73
Carpenter	14.17	5.89	6.86
Carpenter Form Builder	6.50	6.50	6.50
Cement Mason	6.50	5.40	6.41
Chemical Process Technician (Plastics)	12.63	12.63	12.63
Circuit Board Designer (Electronics)	10.00	10.00	10.00
Circuitry Technician (Electronic Technician)	16.77	14.77	15.95
Computer Numerical Control Machinist	7.92	7.25	7.50
Construction Equipment Operator, Grading	7.00	6.00	6.43
Conventional Photo Technician	9.68	9.68	9.68
Cook, Hotel and Restaurant	7.88	6.00	6.55
Cylinder Maker	13.25	13.25	13.25
Cylinder Plater Technician	9.68	9.68	9.68
Dental Technician	9.00	8.50	8.83
Deputy Sheriff	7.08	6.59	6.65
Diesel Mechanic	13.81	5.00	13.61
Drafter, Tool Design	9.00	9.00	9.00
Dry Cleaner	5.00	5.00	5.00
Drywall Mechanic	6.75	6.75	6.75
Electric Appliance Servicer	7.50	6.50	7.04
Electric Motor Repairer	11.17	6.50	7.83
Electrical Discharge Machine Set-up Operator	7.47	7.47	7.47
Electrician	12.75	5.75	9.80
Electrician-Instrument Repairer	13.10	10.12	12.85
Electronic Cash Register Technician	6.50	6.50	6.50
Electronic Engraver Technician	9.40	9.40	9.40
Electronic Technician Specialist	8.98	8.98	8.98
Electronics Technician (Central Station)	9.97	8.00	8.98
Enviromental Control System Installer/Servicer	10.50	6.25	7.42
Etcher	13.25	13.25	13.25
Farm Equipment Mechanic	6.00	5.50	5.83
Fire Medic	6.64	6.50	6.56
Firefighter	5.83	5.83	5.83
Flexographic Press Operator	9.20	9.20	9.20
Floral Designer	3.75	3.75	3.75
Fork Lift Mechanic	13.29	7.40	10.14
Frame Maker (Furniture)	6.25	6.00	6.07
Front End Mechanic	5.00	5.00	5.00
Fuel Injection Servicer	6.50	6.50	6.50

*Source: Apprenticeship and Training Division, NC Department of Labor, April 1, 1986.

Trade	Maximum Hourly Rate	Minimum Hourly Rate	Average
Funeral Service (Embalmer)	$ 4.00	$ 4.00	$ 4.00
Furniture Maker/Repairer	6.50	6.50	6.50
Furniture Upholsterer	5.50	5.50	5.50
Gage Maker	10.22	10.22	10.22
Gas Appliance Servicer	7.00	7.00	7.00
Glazier	7.00	6.50	6.83
Greenskeeper	6.50	6.50	6.50
Health Care Technician (Medical)	5.34	5.34	5.34
Health Care Technician (Psychiatric)	5.34	4.21	4.95
Heavy Construction Equipment Operator	6.50	5.77	6.20
Heavy Equipment Mechanic	11.95	5.75	9.32
Illustrator Artist	7.50	7.50	7.50
Industrial Carpenter	11.55	11.55	11.55
Industrial Hygiene Inspector	10.32	10.32	10.32
Industrial Machine Repairer	12.41	9.29	10.51
Installer-Technician (Cablevision)	8.27	8.27	8.27
Instrument Fitter	13.29	10.49	12.19
Insulator	11.60	8.00	8.34
Jeweler	8.00	8.00	8.00
Knitting Machine Fixer	10.10	10.10	10.10
Land Surveyor	8.00	6.00	7.38
Landscape Gardener	7.50	7.50	7.50
Lead Burner	11.32	11.32	11.32
Line Erector	12.60	6.50	11.99
Locksmith	6.96	6.96	6.96
Loom Fixer	6.58	6.58	6.58
Machinist	16.77	6.50	10.07
Machinist-Mechanic	13.15	7.51	12.64
Machinist, Automatic Screw Machines	7.95	7.95	7.95
Machinist, Multiple Milling, Boring, and Turning	7.74	7.74	7.74
Maintenance Electrician	18.10	6.00	13.08
Maintenance Mechanic	14.17	6.50	11.38
Maintenance Mechanic (Mobile Home)	6.00	6.00	6.00
Maintenance Mechanic, Plant	13.81	8.05	9.87
Manufacturing Technician	8.77	8.77	8.77
Meat Cutter	8.55	8.55	8.55
Mechanic, Aircraft Accessories	6.50	6.50	6.50
Millwright	18.10	6.50	11.87
Millwright (Construction Machinist)	16.77	16.77	16.77
Motor Boat Mechanic	6.00	6.00	6.00
Motorcycle Mechanic	6.50	6.50	6.50
Nuclear Medicine Technologist	7.70	7.70	7.70
Office Machine Repairer	7.50	7.43	7.45
Offset Press Operator	7.50	7.50	7.50
Oiler (Industrial)	13.91	13.81	13.85
Optician	5.60	5.25	5.53
Painter	10.40	6.96	9.84
Parts Clerk	5.90	4.38	5.18
Photo Retoucher	13.25	13.25	13.25
Photo Stripper	13.25	13.25	13.25
Photoengraver	9.50	7.85	8.48
Photographer	13.25	13.25	13.25
Photolithographer	6.50	6.50	6.50

Trade	Maximum Hourly Rate	Minimum Hourly Rate	Average
Pipefitter	$18.10	$ 7.50	$11.57
Plumber	13.35	6.00	8.71
Police Officer	10.80	6.25	9.26
Power and Water Mechanic	11.32	11.32	11.32
Precision Sheet Metal Fabricator	13.29	7.50	11.42
Project Maintenance (Maintenance Repairer)	6.67	6.00	6.37
Public Safety Officer	6.43	6.43	6.43
Radio Electrician Technician	9.50	9.50	9.50
Radio Repairer	7.50	7.00	7.25
Radio-Television Repairer	6.25	6.00	6.14
Re-Etcher	13.25	13.25	13.25
Refrigeration Mechanic	14.17	13.81	13.93
Reinforcing Ironworker	12.00	6.50	9.76
Roller Maker (Rubber Goods)	8.20	8.20	8.20
Roofer	6.67	6.67	6.67
Rotogravure-Press Operator	13.25	13.25	13.25
Saw Filer	5.50	5.50	5.50
Screw Machine Operator	7.00	7.00	7.00
Screw Machine Operator-Tool Grinder	7.00	7.00	7.00
Sewing Machine Repairer	5.00	5.00	5.00
Sheet Metal Worker	18.10	6.00	10.09
Small Gas Engine And Equipment Repairer	7.39	7.39	7.39
Specialty Press Operator (Business Forms)	7.50	7.50	7.50
Spring Coiling Machine Setter	8.56	8.56	8.56
Sprinkler Fitter	9.25	9.25	9.25
Stained Glass Designer	6.00	6.00	6.00
Stained Glass Glazier	6.00	6.00	6.00
Stripper Technician	9.68	9.68	9.68
Structural Ironworker	12.00	12.00	12.00
Tool and Die Maker	11.98	8.00	10.58
Tool Designer	10.03	10.03	10.03
Tool Grinder II	8.14	8.14	8.14
Traffic Paint and Sign Technician	7.20	7.20	7.20
Traffic-Signal Repairer	9.02	7.63	8.33
Truck and Trailer Body Repairer	13.21	6.50	11.45
Upholsterer, Inside	6.50	6.50	6.50
Vending Machine Mechanic	8.00	7.55	7.64
Water Plant Operator	6.25	6.25	6.25
Water Pollution Control Facility Operator	6.25	6.25	6.25
Welder	13.73	7.27	10.24
Wood Model Maker	10.03	10.03	10.03

APPENDIX B

Glossary of Terms

APPRENTICE: A person who meets the minimum qualifications for entry into a trade or craft, who is of legal working age, and who has entered into a written agreement with an employer under which the employer is to train the apprentice in an apprenticeable occupation. If the apprentice is a minor, the agreement must be signed by the parents or a guardian.

APPRENTICEABLE OCCUPATION: An occupation which:

A. Customarily must be learned by practical training on the job.
B. Is identified and commonly recognized or accepted throughout the industry.
C. Requires 2,000 or more hours of work experience to learn.
D. Requires related instruction to supplement the work experience.
E. Involves the development of skill sufficiently broad to be applicable in like occupations throughout an industry.

APPRENTICESHIP AGREEMENT: A written agreement, registered with the North Carolina Department of Labor, providing for not less than 2,000 hours of reasonably continuous employment and providing for participation in an approved schedule of work experience through employment, which is supplemented by a minimum of 144 hours per year of related instruction. The actual number of work and course hours will vary depending upon the particular apprenticeable occupation.

APPRENTICESHIP COMMITTEE: A group of people established to carry out the development and administration of apprenticeship training programs on behalf of program sponsors. The committee may represent labor-management interests at the national, state, or local levels. Where a labor union is involved in an apprenticeship program, the committee is called a **Joint Apprenticeship Committee** and is composed of an equal number of representatives from management and the union.

APPRENTICESHIP DIVISION: A division of the North Carolina Department of Labor that directly administers the apprenticeship system for the department and that stimulates and assists employers in the development, expansion, and improvement of apprenticeship and training programs. The division's principle functions are to encourage the establishment of sound apprenticeship and training programs and to provide technical assistance to employers in establishing and operating such programs.

APPRENTICESHIP REPRESENTATIVE: An employee of the North Carolina Department of Labor who promotes apprenticeship programs with prospective sponsors, assists in developing programs for sponsors, and provides services to programs and apprentices as long as the program is in operation.

APPRENTICESHIP STANDARDS: The document which embodies the procedure for the selection and the training of apprentices, setting forth the terms of the training, including wages, hours, conditions of employment, training on the job, and related instruction. The duties and responsibilities of the sponsor, including administrative procedures, are also set forth.

JOURNEYMAN: A worker who is fully qualified as a skilled worker in a given craft or trade.

NORTH CAROLINA DEPARTMENT OF LABOR: The North Carolina State agency designated under State law to administer the State's apprenticeship program.

PROBATIONARY PERIOD: A trial period of not more than 500 hours on the job or four months, whichever is less. During this period, the apprenticeship agreement may be canceled at the request of either the apprentice or the sponsor. After completion of the probationary period, the agreement may be canceled by the sponsor only for reasonable cause or at the request of the apprentice.

PROGRAM SPONSOR: An individual employer, a group of employers, or a combination of employer(s) and labor union(s) who have undertaken to establish and operate a formal apprenticeship program to develop skilled craftsmen in apprenticeable occupations.

RATIO: The number of registered apprentices in training compared to the number of journeymen employed by the employer that the sponsor represents.

REGISTRATION AGENCY: The North Carolina Department of Labor Apprenticeship and Training Division.

RELATED INSTRUCTION: Classroom training related to the craft or trade being learned (144 hours per year of instruction is the minimum normally recommended). To provide the required related instruction, program sponsors may request the assistance of local technical schools in establishing classes for apprentices. Sponsors also cooperate with the local vocational school officials in determining the subjects to be taught and the qualifications of instructors. Program sponsors may further recommend journeymen in the trade who have the knowledge and ability to teach related classroom instruction. Sponsors may elect to operate training classes at the work site or use home study courses for their apprentices' related instruction.

SKILLED CRAFTS AND TRADES: Occupations which require an extended period of on-the-job training in conjunction with related instruction to provide individuals with the high level of skill necessary to perform required job tasks.

VOCATIONAL EDUCATION: That education which prepares a person specifically for a particular occupation. Apprenticeship is one of several forms of vocational education. Apprenticeship programs are designed to serve the needs of people in two distinct groups: 1) Adults who have entered employment who need additional skills; and 2) Youth and adults who are preparing to enter occupations in crafts and trades that require a high degree of proficiency.

WORK EXPERIENCE: The time that an apprentice spends on the job under journeyman's supervision learning, step-by-step, through demonstration and practice, the individual work processes of a skilled occupation.

APPENDIX C

North Carolina Department of Labor
Apprenticeship and Training Division
214 West Jones Street
Raleigh, North Carolina 27603
Telephone: (919) 733-7533

Kenneth C. Pittman
Deputy Commissioner for Education and Training

John M. Crumpton, Jr.
Director
Apprenticeship Division

James J. McManus, Jr.
Assistant Director
Apprenticeship Division

WESTERN REGIONAL APPRENTICESHIP OFFICES

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Post Office Box 732
Maiden, NC 28650
(704) 428-9187

Western Field Supervisor
Lanny Shelton
Post Office Box 732
Maiden, NC 28650
(704) 428-8998

Quality Assurance Representative:
Allen Sigmon
Post Office Box 736
Maiden, NC 28650
(704) 428-9532

Promotional Representative:
Bibb C. Edwards
Post Office Box 11
Harmony, NC 28634
(704) 876-1037

Apprenticeship Representatives:
C. W. Campbell
Post Office Box 1923
Salisbury, NC 28144
(704) 633-2792

Counties Served:
Cabarrus, Davidson, Davie, Iredell, Rowan, Union

Gary Hammer
Post Office Box 9872
Asheville, NC 28815
(704) 298-0964

Buncombe, Cherokee, Clay, Graham, Haywood, Henderson, Jackson, Macon, Madison, Swain, Transylvania

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Alice Madenspacher
Post Office Box 637
Harrisburg, NC 28075
(704) 455-6365

Cleveland, Gaston, Lincoln, Mecklenburg, Polk, Rutherford

Fred Marion
4351 Johnsborough Court
Winston-Salem, NC 27104
(919) 768-3055

Alleghany, Ashe, Forsyth, Stokes, Surry, Watauga, Wilkes, Yadkin

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APPENDIX C

Apprenticeship Representatives:	**Counties Served:**
Brenda Saunders **Post Office Box 1676** **Marion, NC 28752** **(704) 652-8417**	**Alexander, Avery, Burke,** **Caldwell, Catawba,** **McDowell, Mitchell,** **Yancey**
Lanny Shelton **Post Office Box 732** **Maiden, NC 28650** **(704) 428-8998**	**Caswell, Guilford,** **Rockingham**

EASTERN REGIONAL APPRENTICESHIP OFFICES

Area Office	**Eastern Field Supervisor**
115 Broadfoot Avenue Post Office Box 53634 Fayetteville, NC 28305 (919) 486-1441	**Edward D. Hartsell** **Post Office Box 201** **Greenville, NC 27835-0201** **(919) 752-7304**
Apprenticeship Representatives:	**Counties Served:**
Barry L. Judge 1705 Pine Forest Drive Scotland Neck, NC 27874 (919) 826-3789	**Bertie, Camden, Chowan,** **Currituck, Dare, Edgecombe,** **Gates, Greene, Halifax,** **Hertford, Jones, Lenoir,** **Martin, Northampton, Nash,** **Pasquotank, Perquimans, Pitt,** **Tyrrell, Washington, Wayne,** **Wilson**
Edward D. Hartsell Post Office Box 201 Greenville, NC 27835-0201 (919) 752-7304	**Beaufort, Brunswick, Carteret** **Columbus, Craven, Duplin, Hyde** **New Hanover, Onslow, Pamlico,** **Pender**
James W. Rogers, Jr. Route 1, Box 82A Cameron, NC 28326 (919) 245-7596	**Anson, Chatham, Hoke,** **Lee, Montgomery, Moore,** **Richmond, Robeson,** **Scotland, Stanly**
William H. Stallings, Jr. Post Office Box 424 Garner, NC 27529 (919) 772-7375	**Bladen, Cumberland, Harnett,** **Johnston, Sampson, Wake**

APPENDIX D

Frequently Asked Questions and Answers about Apprenticeship

1. **Q:** Are apprenticeship completers among the highest paid workers in North Carolina?

   A: Yes. — Apprenticeship completers earn more than the average worker in North Carolina. The completer, called a journeyman, averages about $10 per hour in North Carolina, immediately after becoming a journeyman.

2. **Q:** Is apprenticeship used only in the construction trades?

   A: No. — Of the over 700 recognized apprenticeable occupations, only 16 are in the construction trades, with the balance ranging from tool and die maker and biomedical equipment technician to photostripper (an occupation in the printing industry). Generally speaking, any occupation is apprenticeable that is not management, that is not normally trained for in a four-year college program, and that requires at least one year of on-the-job training.

3. **Q:** Is apprenticeship indentured servitude?

   A: No. — Apprenticeship is voluntary on the part of both the apprentice and the employer. Either may discontinue their participation at any time.

4. **Q:** Do apprenticeship program sponsors seek apprentice applicants from students who are high achievers in their school work?

   A: Yes. — Apprenticeable occupations generally require above average intelligence, above average hand/eye coordination, and above average motivation.

5. **Q:** Do most apprenticeable occupations offer dull, dirty jobs?

   A: No. — Most apprenticeable occupations involve a variety of interesting tasks and, while there are exceptions, usually take place in clean, safe surroundings.

6. **Q:** Are most apprenticeship programs run by labor unions?

   A: No. — Nationally, over half of all apprenticeship programs are run alone by businesses. In North Carolina there are 44 apprenticeship programs that have union co-sponsorship out of about 1300 programs that are registered with the State. Most programs with union co-sponsorship register an above average number of apprentices, offer excellent wages, and provide high-quality training that utilizes well-designed, proprietory, training materials.

7. **Q:** How young a person can register as an apprentice?

   A: — Federal and State regulations provide that an apprentice must be at least 16 years of age.

8. **Q:** Is a person who completes a community college vocational program considered to be a journeyman?

   A: No. — The only means of attaining true journeyman status is through formal apprenticeship. Completers of community college vocational programs are generally considered good candidates for entry into apprenticeship programs in the occupation for which they have received training and are often awarded advanced standing in the required related instruction portion of the program.

9. **Q:** Does the average tool and die maker (which is an apprenticeable occupation) earn more money than the average civil engineer?

   A: Yes. — "Tool and die maker" is the seventh highest paid occupation in America out of about 24,000 occupations listed in the Dictionary of Occupational Titles, according to a recent report of the U.S. Department of Labor.

10. **Q: Does it costs the average apprentice about as much to complete an apprenticeship as it costs the average student to complete a bachelors degree?**

    A: No. — The average apprentice pays little or nothing for training received through apprenticeship, but rather earns in a typical four-year program about $50,000 in wages.

11. **Q: Are the lifetime earnings of the average apprenticeship completer greater than those of the average college graduate?**

    A: Yes. — While there are occupations for which one is prepared through a college education that pay more over the lifetime of the worker than would be paid an apprenticeship completer, the average journeyman has greater earnings potential than the average college graduate. For example, in a recent national meeting the executive of a national training fund for sheet metal workers is quoted as having said that the normal lifetime earnings expectancy of a journeyman sheet metal worker is in the $1,000,000 range. Similarly, in North Carolina it is fairly common to find journeymen being paid $30,000 to $50,000 a year, recognizing that a portion of that pay is for shift premiums and overtime.

12. **Q: How many apprenticeable occupations are there?**

    A: — There are over 700 apprenticeable occupations that are currently recognized by the U.S. Department of Labor.

13. **Q: Do most of the 100 largest employers in North Carolina operate registered apprenticeship programs?**

    A: Yes. — Approximately 65 of the 100 largest employers in North Carolina sponsor registered apprenticeship programs.

14. **Q: Who approves and registers apprenticeship programs in North Carolina?**

    A: — The North Carolina Department of Labor is the government agency designated by State law (since 1939) and by the U.S. Secretary of Labor (for federal purposes) as the approval and registration agency in North Carolina. Thirty-two other states and territories have a similar arrangement, with the remaining states being administered by the U.S. Department of Labor. Completers of North Carolina approved apprenticeship programs are nationally recognized to be journeymen.

15. **Q: Is apprenticeship an "earn while you learn" system as opposed to a "pay your own way" system?**

    A: Yes. — Apprentices earn a wage from the first day of their training, usually beginning at about one-half of the journeyman wage, with regular wage increases during training as they gain skills that are of value to the program sponsor.

16. **Q: What is the current average North Carolina wage for completers of apprenticeship?**

    A: — North Carolina Department of Labor figures show $10 to be the approximate average hourly wage for journeymen in the apprenticeable occupations. The highest wages are approaching $20 per hour (including fringe benefits) while the lowest are about $6 per hour.

17. **Q: How much does the average apprentice earn at the beginning of apprenticeship training?**

    A: — Since apprentices begin at about one-half of the journeyman rate, most apprentices begin at an average wage of about $5 per hour.

18. **Q: Are apprenticeship programs for men only?**

    A: No. — While some women still tend to think of apprenticeable occupations as "man's work" and are, therefore, hard to recruit into apprenticeship programs, they have proven to be excellent candidates for virtually all of the apprenticeable occupations. At present in North Carolina about 7 percent of the State's apprentices are women.

19. **Q: Can workers in "high tech" jobs be trained through apprenticeship?**

    A: Yes. — Many workers in the so-called high tech occupations are regularly trained through apprenticeship. Examples include: computer programmers, biomedical equipment technicians, opticians, electronic technicians, and circuit board designers.

20. **Q: Should high school vocational counselors know the benefits and opportunities available to their students through apprenticeship?**

    A: Yes. — While too few high school vocational counselors are fully informed about apprenticeship, they should learn the potential offered to the qualified young person who enters and completes a registered apprenticeship program. Most of the apprenticeable occupations offer good working conditions, interesting job tasks, and remarkably high wages. Moreover, the apprentice is paid while learning, rather than having to pay. In fact, the availability of apprenticeships is small, but for those who succeed in finding one, the prospect of a happy and rewarding life is considerably above average.

21. **Q: Are apprenticeship completers widely recognized for the skills they have learned?**

    A: Yes. — Each apprentice who satisfactorily completes an apprenticeship program receives the nationally recognized North Carolina Department of Labor "Certificate of Completion of Apprenticeship," which then recognizes the former apprentice as a journeyman in the occupation in which training was received.

22. **Q: Is high school completion a requirement for apprenticeship applicants?**

    A: While there are a few exceptions, high school graduation is a requirement for apprenticeship applicants unless the applicant is still in school. Courses in algebra, geometry, trigonometry, and the sciences are especially helpful in being considered for an apprenticeship in many of the better paid apprenticeable occupations.

23. **Q: Does completing an apprenticeship program offer potential for advancement into leadership positions in business and industry?**

    A : Yes. — Many North Carolina corporate presidents, plant managers, and other responsible leaders began their careers as apprentices. President Andrew Johnson, who was born in downtown Raleigh, began his working career as an apprentice.